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Teachers Using Computers in Successful, Effective and Meaningful Ways

by
Juanita Perea-Jimenez

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by

Juanita Perea-Jimenez

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Acknowledgements

Having come from a large family, eighteen members, having had to overcome many cultural, social, language, and economic barriers, it has been my goal to someday attend postgraduate school and receive a degree in higher education such as a Master of Arts Degree in Education. My father taught me that money can come and go, but that education can never be taken away from me. To me and to my father education has the highest level of power because knowledge equals to power.

I must thank several people who were there all the way to help me make my dream come through. It seemed an impossibility to ever receive a degree of higher education, but certainly my professors were always there for me from my undergraduate education at CSU Monterey Bay, through my credential education and though my postgraduate schooling. Teachers, family members, and friends believed in me from the moment I was encouraged to go back to school and continue with my education.

I sincerely thank those people who made the most significant difference in my life. My husband was the first person to believe in me, when he encouraged me to enroll in high school to continue with my education. For the past twelve years my husband has taken care of the home and of the family, while I went through four years of high school and eight years of college education. For the past eight years he has taken care of our son, our step-son, and our four adopted children. Without him, I would have certainly have become a housewife without a future for me or for my own family.

My children have also been very patient and understanding of me wanting to be the first and only member of our family to receive a higher education. Every one of them has done their share to make my life easier for me to concentrate in my studies. I am proud of my husband and my children and I am sure that hey are proud of me.

My professors from my CSU Monterey Bay Dr. Ledesma, Dr. McEady, Dr. Blackwell, Dr. Meador, Dr. Hughes among other wonderful professors that have spent all of their time, knowledge, professionalism, patience, and energy with me. They did not only teach me the subject matter, but they also taught me respect, love and passion for the teaching profession. However, it seems that there is a professor who will never get rid of me because she taught me in her classes as an undergraduate and as a graduate student. Dr. Sleeter has seen my personal, my professional, and my academic growth throughout the eight years that she has met me. She taught me as a freshman, as a junior, as a senior, in my first year and my last year in the Master's of Education Program.

I must say thank you to Dr. Hughes who always made himself available when I needed his support and his guidance. Dr. Sleeter worked extra hours every week to return my work with positive and constructive feedback. Both of them made my dream possible by always having high expectations and setting up clear objectives for me to finish up my work. They always expected high quality work of me and they made every attempt and effort have me complete my work on time to graduate in June of 2003.

ABSTRACT

This was a research study where five teachers and I participated in the research. I wanted to find out how can teachers from a rural school with limited technological resources be educated to use the existing computers in effective, successful, and meaningful ways. At the same time, how can computers be used as personal tools and as educational tools and how can teachers improve their comfort level, their computer knowledge, abilities and skills. The participants took the California Technology Assessment Profile (CTAP) twice during the research study. I also interviewed them twice during the duration of the study and worked together as a team using computers for thirty minutes every week for a period of six months.

The literature supported my findings and the CTAP showed the teachers' computer knowledge, abilities, and skills. The Apple Classrooms of Tomorrow (ACOT) taxonomy on levels of use and the data I gathered showed that the participants of this study were at the beginning levels of use. The Hall and Hord Stages of Concern taxonomy and the information I collected showed that teachers go through those stages every time the attempt to adopt or adapt any new technology. The literature and my findings also showed that teachers must face a great amount of barriers when attempting to adopt and to adapt any new innovation.

In this research study I also found that the basic computer education model components must first be in place for it to be successful, meaningful, and effective for the participants. The approach to invite teachers to be part of a computer education program must be strategic systematic and the view of pedagogy and learning must be of knowledge construction to stay away from the traditional instruction views. By doing

this the participants must have opportunities to reflect, to analyze, to challenge their views about teaching and learning.

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The Meaning of Computers

"Oh, dumb machines"

Two teachers, Mrs. Taylor and Mrs. Jimenez, come into an old classroom where four old dusty computers are sitting on student's desks.

"Oh, Mrs. Taylor you have computers in your classroom," says Mrs. Jimenez.

"Oh, yes and they are collecting a lot of dust because the dumb machines always break down," Mrs. Taylor replies.

"Really, then what happens when the machine breaks down," asks Mrs. Jimenez.

"Well, the dumb machines are as dumb as the teacher because all I know is how to turn it on and off and my second grade students do the rest, but I only let them take their comprehension quizzes in it and nothing else," responds Mrs. Taylor.

"Oh! Really who told you that and what makes you think that the computers are smarter then you," asks Mrs. Jimenez.

"Well, nobody has told me that, but I just figured it out myself because I am so afraid to touch them and ruin them," Mrs. Taylor responds.

Mrs. Jimenez leaves Mrs. Taylor's classroom and comes back next day.

"Good morning, Mrs. Taylor I came to ask you if you would be interested in learning how to operate the computers," asks Mrs. Jimenez.

"Yeah, maybe but I don't know how much more I can learn I been teaching for over 25 years and I am so old that I am not sure if anything will stick in my old brain," replies Mrs. Taylor.

"What makes you think that you can't learn to use these machines, they can't see you to criticize you or to judge your knowledge or abilities," responds Mrs. Jimenez.

"Well, maybe not but I do not have the time or the patience to spend four hours in front of a dumb machine to end up learning nothing and instead I end up feeling that the machine is smarter than me," replies Mrs. Taylor.

"How would you like to begin learning to use these machines," asks Mrs. Jimenez.

"Well, I am not sure because I have attempted to learn to use them before, but it has not worked for me. And since I don't have to know it to teach it to my students, then I am not worried about it. You know, when children begin taking standardized testing on computers, then I might put a little bit of effort to learn how to do something with them," responds Mrs. Taylor.

"Would you be interested in me coming to your classroom during a school day for a few minutes and help you deal with these machines," asks Mrs. Jimenez.

"I am not sure, but it might be worth trying," Mrs. Taylor responds.

"When would you like me to start coming to help you," Mrs. Jimenez asks.

"Oh! But does that mean I get to pick a time and date. Can I also ask you to teach me how to do a grid to enter the students' test scores or is that asking for too much already," asks Mrs. Taylor.

"Oh, not at all I'll be more than happy to come help you in whatever you need," responds Mrs. Jimenez.

"Can you come at lunch-time or after school for 20 minutes once a week on Thursday or Friday? But no more than that because my brain fries with too much modern information. Maybe you can help me do some things that I have wondered about for the past 20 years, but I don't know if I can do them in these computers," says Mrs. Taylor.

"My God, it is unbelievable that a young teacher will be my MAESTRA and that I'll be learning to use these computers," responds Mrs. Taylor to finish the conversation.

Mrs. Jimenez and Mrs. Taylor agree to meet once a week for 20 minutes and alternate the days to be during lunch-time or after school hours. This story reflects the truth about many teachers' experiences with computers in their classrooms. One of my last names is Jimenez and this is a real story that I experienced with a veteran teacher from my school. As a computer user I have volunteered to set up a computer education program model for teachers of my school site.

Statement of Problem and Purpose

The school where I work received over 180 PC computers and some other equipment, but few teachers were using it. There was no computer education for

the teachers provided at the school. There was some expensive software purchased, but it was hardly being used by the students or by the teachers. Most teachers were veteran teachers who were afraid to use the computers. They were interested in learning and teaching about computers, but there was no computer support in the school.

The main problem this thesis addresses was that the computers and the software were not being used efficiently by the students or by the teachers and I wanted to do something about it. The computer lab was used occasionally when the parent volunteer computer instructor had time to teach small group of students. The computers from the library were being used only when the librarian gave lunch passes to a few students to come during lunch time. The classroom computers were never used in most of the lower classroom and rarely used in a few of the upper grade classrooms. Most teachers were not using the computers in school as instructional tools or as personal tools.

In this project, I was hoping to develop a leadership team at the school for future support to other teachers to utilize the existing technology for personal use as well as integrating it into the curriculum. I also became part of a team that provided the tools for each individual teacher, including myself, to move up to the next learning level in utilizing the existing technology of our school.

Research Questions

- How can teachers from a rural school with limited resources be educated to use existing computer in effective, successful and meaningful ways?

- How can computers be used as a tool for teachers' different needs?
- How can teachers improve their computer perception, comfort level, knowledge, skills, and abilities?

Changes in the State's Teacher Credential Requirements

The participants of this study were veteran teachers who received a life-time teaching credential from the State of California. Many years ago in California teachers received life-time credentials, meaning that they did not have to take any additional courses to clear their credential. During the same time, universities and colleges did not require for any of their future graduating teachers to receive any kind of technology training. Computers started to be used more widely in education in the mid-eighty's and teachers with more than 15 years of experience were not exposed to them. Recently, the state of California began to require teachers to take one computer course within their first five years of teaching in the classroom, or before they entered the classroom. The computer course had to be related to uses within the classroom. As of July 1, 2002 the state of California was requiring all teachers to take two computer courses within their first five years of teaching to clear their credential, or before they received their credential. Again the computer courses had to be state approved and related to classroom use.

Two computer courses were required by the state of California because the state acknowledged the importance of new teachers gaining new knowledge about the newest technology. Many colleges and universities are now integrating computer education courses for future teachers within their

graduation requirements, so that new teachers are prepared with the technology knowledge, skills and comfort level when they enter the profession.

Technology Standards

The California Commission on Teacher Credentialing (CTC) Technology Standards and the National Education Technology (ISTE NETS) Standards for Teachers listed all of the technology standards required for teachers as of the time of this study. The CTAP (California Technology Assessment Profile) web site provided a link to those standards. The standards provided there have a brief description of what teachers should use, know and understand about technology. The descriptions were short, clear, and direct. Some descriptions provided examples of the standards. For example, the category on the General Computer Knowledge and Skills, one of the CTC Standards asks for each teacher to demonstrate competency in the operation and care of computer related hardware (e.g. cleaning input devices, avoiding proximity to magnets, proper startup and shut down sequences, scanning for viruses, and formatting storage media).

Due to the recent changes in certification requirements and the new technology standards for teachers, I decided to be a tool to provide computer education sessions for teachers to allow everyone to be part of a computer leadership team. At the same time the study exposed teachers to use computers as educational and as personal tools. These goals proved to be more challenging than I initially anticipated, and I decided to identify the challenges in order to plan better how to address those goals. With the available

resources and once barriers were identified by the group I became a participant of the study and a tool for change.

Your Junk, Our Treasures

I worked in a rural school located in Monterey County, outside of Salinas. The school was over fifty years old and has very few technological resources. The school had a few new portable classrooms and many old ones. The old classrooms had never been remodeled, but were in fair condition. There were twenty-six female teachers and one male teacher, in my school. Nine teachers taught in bilingual classrooms and eighteen in English only classrooms. Our staff came from at least two different cultural backgrounds, Mexican-Americans and Anglo-Saxon. Their economic and political backgrounds were also very different because some come from professional parents, lawyers and teachers, and others from working class families, agricultural and packing. Some of the teachers were very conservative while others are very liberal. Teachers stayed teaching in the same school for many years, many until retirement. The majority of the teachers lived either in Santa Cruz or in Salinas.

At the end of the year 2000 our school received from a corporation in Salinas over 180 computers, some monitors, printers, chairs, tables and computer projectors to be used in the classrooms and in the library as well as in a computer lab, which was not being used any more. A parent from our school worked for the corporation and knew that it was going to donate the computers to a school. The parent told the school about the computers and the corporation offered them to our school first. Our school accepted them and they company

delivered them to us over the summer of 2001. They did not give us monitors for every computer, but the computers were in excellent condition. Our school was able to get funding for the CD-ROM, speakers, keyboards, some furniture, the net cards, and the sound cards for all of the computers. Another corporation from San Jose donated to our school monitors for most of the computers.

The computer instructor, a parent volunteer from the school was concerned because the majority of the teachers from kindergarten through fifth grade had computers in the classroom and they were not using them, some did not even want them in their classrooms. The computers from the computer lab and from the library were rarely used by students or by classroom teachers unless the parent volunteer computer instructor, organized computer instruction periods for the students. Several times the administrators and the computer instructor expressed serious concern about the limited use of those computers in the staff meetings.

During staff meetings several of the teachers also expressed their unfamiliarity with the function of the computer software as well as with the operation of the machines. The majority of the teachers were veteran teachers, with over ten years of experience, and very few were new teachers. There was no funding available to provide computer education for the teachers, for those who expressed their desire to learn how to operate the machine as well as how to integrate it into the curriculum.

After hearing many of the teachers' concerns about not having enough knowledge, skills and comfort in using the equipment or the software, I thought I

could be an instrument to help alleviate the problem. With experience and with practice I have become more and more comfortable using computers. I knew my computer knowledge and skills were very much needed because during my interview for the job at my school, the bilingual resource teacher said, "you are the one we need at our school". At that moment I realized that this school was in need of teachers with computer knowledge. Months after the school bought new software and computers were donated, but then many teachers did not know what to do with them. At that moment I knew that something had to be done and that I was the one to take the lead to start making a difference at my school.

At my school site the majority of the teachers held a life-time elementary level credential, therefore they were not required to take any computer courses or any other type of courses to renew their credential. In other words there were many veteran teachers who had not taken any computer courses related to technology and their use in the classroom. The administrator had never required teachers to go to a workshop on computers and their classroom use because on staff development days there were always many other choices, and very few computer education sessions. At the same time, there was no funding to hire a full-time or even part-time computer trainer. The parent volunteer computer instructor came and helped some children, usually GATE (Gifted and Talented Education) children, during and after school.

Description of Terms

Below are some terms that are used in this thesis, that readers might not be familiar with.

1. CTAP stands for California Technology Assessment Profile
2. ACOT means Apple Classrooms of Tomorrow
3. The CTC (California Commission on Teacher Credentialing) Technology Standards for Teachers
4. ISTE (International Society for Technology Education) Technology Standards for Teachers
5. NETS (National Education Technology Standards) Technology Standards for Teachers
6. Multiple Subject Credential is a teaching credential that allows teachers to teach all the academic subjects in kindergarten through fifth grade classrooms in California.
7. Clear credential, is earned by completing a set of required courses for all teachers who hold a preliminary multiple subject credential in California. Those teachers must take a computer class, a health course with a CPR and first aid component and a special education course during the first five years of having received a preliminary credential.

Constraints and Considerations

One of the limitations of this research study was my knowledge, abilities, skills, and experience as a researcher. My limited education in qualitative research and my biases were elements that constrained the design and the analysis of the study. My limited teaching experience did not allow me to create lessons that would apply to other grade levels, above or below my own second grade level. I have only taught in a second grade setting, so my knowledge

about curriculum, standards, expectations, students' development is limited to what I have experienced.

Another limitation was the many times that our computer education sessions were cancelled. Due to staff meetings, curriculum development days that conflicted with the computer class, teachers' request to cancel, among many other reasons gave us a maximum of three computer classes a month. The time spent in the computer education sessions was very limited for the teachers and for myself. Researchers found that in order for any program model to leave sustainable change it takes years of in-service sessions for the teachers.

The limitation of resources and technical support were significant barriers for this research. In several occasions the printer ran out of ink and the participants were unable to print what they had created in class. Other times the computer screen would turn black and freeze on us and there was nothing that we knew to do to bring up the Windows program, so we had to shut down the computer until the computer technician had time to look it over. More than one time a computer had to be replaced and most of the 15" monitors had to be replaced as well for 17" monitors, which had a better screen resolution. We did not have a scanner available to show them how to operate it. Later into the year, I bought a scanner and was able to show them the final product of what the students had done with the scanner in my own laptop. The school computers did not have the newest scanner or printer connection, called USB port, therefore, I had to purchase a laptop with my own money to create provide a model for the teachers.

Another consideration to this research is the small number of participants. The sample was significantly small and therefore, the data collected was small. The findings can only apply to the location and people where it was conducted due to the uniqueness of the participants and of the site as well as to the particular design of this research.

Overview of Action Thesis

In chapter two the literature review provides an explanation of the framework of how teachers adopt and adapt new technology into the curriculum based on a ten year research conducted by ACOT researchers. This literature also provides an overview of the taxonomy of Stages of Concern and how that is supported by other researchers' studies and philosophical views. All of those frameworks will explain the elements of how people adopt any new innovation, how to organize any program around teachers' needs, the environment necessary for the implementation of a new innovation, and the importance of identifying a purpose. The section that follows explores what some of the computer education models for teachers look like. The last section of the literature review presents the barriers that teachers must face when adopting and adapting computer education into the curriculum.

Chapter three explains about the overall methodology of the design, setting, research participants, data collection, instruments and data analysis. In this chapter I explain all the details of the process of this study. In chapter four I report the findings of the study based on information obtained from the CTAP assessment and from a set of interviews from each of the five participants. The

recommendations and discussion is based on the interviews and on the literature review are in chapter five. The last chapter lists all of my references used for this study. The last section is the appendix, which has the interviewee questions, the comparison bar graphs for each of the participants and the calendar of activities for the time spend in the computer education sessions.

Experts' Views about Teachers and Computers

In this literature review I am trying to find out how teachers from a rural school with limited resources can be educated to use existing computers in effective, successful and meaningful ways in their classrooms. At the same time, I am trying to identify the barriers that teachers face when adopting the new technology and ways to minimize those barriers.

In the literature I looked at what the elements are which make for successful, meaningful and effective computer education models that create leadership teams at the schools for future support to other teachers in utilizing computer. I also looked for models that allow each participant of training to move to the next learning level in utilizing the computer and at the same time to improve teachers' technology knowledge, skills and computer efficacy. The computer education models must allow teachers to use computers as personal production tools as well to integrate computers into the curriculum. The models must also include several different ways to use the computers to support the students' various learning styles. Successful, meaningful and effective computer education models allow teachers to be members of a team that discovers the needs as well as the solutions to the problems or issues around the use computers in the classroom. Participatory and inclusive projects allow teachers to always participate in the decision making as well as in the action.

Participatory projects create communities where the participants are constantly learning from each other.

The main sections of this literature review discuss the ways in which teachers adopt and adapt new technology through the findings of the ACOT ten-year research study. This literature has an overview of the Stages of Concern taxonomy of teacher development when adopting a new innovation, which was created by Hord and Hall in 1987. The next section provides frameworks by different researchers that help teachers become more comfortable using computers. Those computer education program models suggest different components for a program to be successful, effective and meaningful to teachers. When a program model lacks one or more of its main components, then it becomes a barrier. The last section explains about the many different barriers that teachers must face when attempting to adopt and adapt new technology and the important components are not in place. When the amount of barriers is minimized, then a computer education model has a positive effect on teachers and on student's learning.

How Teachers Adopt Technology

When teachers are faced with the fact that computers are used in most jobs of the 21st Century, then the question is not about what they need to learn, but rather how they are going to adopt new technology. It is rather complex because teachers must overcome the personal as well as the external barriers in order for them to begin understanding pedagogy and learning of the new technology within the classroom context. After the early 1980's many

researchers began to wonder about what was going to happen with teachers and students having computers in their classrooms. Many of them conducted years of research to investigate the impacts of technology in teaching and learning within classroom context.

A ten-year research study called the ACOT (Apple Classroom of Tomorrow) Project was conducted in many different states to investigate the relationship between technology and educators, students, and researchers. Their focus was not about computers or computing, but rather about student and teacher learning and about the integration of technology within the curriculum. Apple Corporation (1995) explains that with this project the researchers wanted to expose and discover how teachers could use technology as a tool to create a more challenging environment for students. They also suggest a teacher development process to achieve those goals. However their main goal was to have a deep understanding of how computers can be used as a learning tool for teachers as well as for students in the many different environments and under many different circumstances.

The most critical findings within a study was the development of a taxonomy that described teachers' levels use of computers. The five stages are: the entry, the adoption, the adaptation, the appropriation and the invention. In the entry level the learner should learn the basics of using the new technology. In the adoption stage the teachers use new technology to support traditional instruction. In the adaptation stage the learner integrates new technology into traditional classroom practice. The appropriation stage focuses on cooperative,

project-based, and interdisciplinary work-incorporating the technology as a new learning tool. In the final stage of invention the teachers discover the new uses for technology tools.

ACOT Taxonomy on Levels of Use

STAGE	**Level of Use**
ENTRY	Learn the basics of using the new technology
ADOPTION	Use new technology to support traditional instruction.
ADAPTATION	Integrate new technology into traditional classroom practice. Here, they often focus on increased student productivity and engagement by using word processor, spreadsheets, and graphics tools.
APPROPRIATION	Focus on cooperative project-based and interdisciplinary work-incorporating the technology as needed and as one of many tools.
INVENTION	Discover new uses for technology tools, for example, developing spreadsheet macros for teaching algebra or designing projects that combine multiple technologies.

(Apple Corporation, 1995)

The researchers of the ACOT study found out that teachers progressed through the stages as they became comfortable with the new technology and learned how to apply it in the classroom. They also found that teachers evolved through those stages when they, along the process, had opportunities to challenge and to reflect on their beliefs about pedagogy and learning. The evolution process speeded up even more when teachers collaborated, when they felt supported professionally, and when the number of barriers was minimized.

Apple Corporation (1995) stated that "teachers progress through stages as they learn how to incorporate technology in classroom environments" (p. 16). In his work, the main goal was for teachers to become comfortable and confident

using computers to then integrate them into the classroom environment. Teachers who had gone through at least the first three stages of adoption were mentoring teachers who were beginning the process. The mentors provided opportunities for reflection, and encouragement to question their beliefs about teaching and learning (Apple Corporation, 1995). Teachers collaborated with co-workers in planning as well as evaluating the standards (set objectives to match mandated standards), the tasks (nature of the assignment), the interactions (communication among peers and with teacher), the situations (time, space and concerns connecting to learner to support activities), and the tools (materials provided to support learning).

Barnett (2001) as a Senior Research Associate in Technology in Education programs and consultant to state departments of education for technology planning and policy issues, also supports the ACOT stages based on his own research and practical experience. He was the principal of one of the first ACOT project schools in California. During the ACOT study project he was also the director of technology for a school district. His philosophical view of successful, effective and meaningful computer education for teachers comes from his extensive involvement as a principal, a director, and a partner of schools and technology. His own philosophy supported the discovered ACOT stages of adoption and adaptation of new technology for teachers.

In addition, the ACOT teachers were constantly reflecting on their experiences and attitudes towards computers. Teachers had opportunities to explore professional development issues. They received the tools and skills to

create a balanced environment between direct teaching and using computers as tools for thinking. Teachers were seeing themselves as the main keys for changing learning environments. They were also learning to teach children how to construct their own knowledge and how to become problem solvers. They were feeling successful with their students and they had many opportunities to reflect on the positive as well as negative experiences. Teachers were active learners and they were always learning under a learner-centered environment (Apple Corporation, 1995).

In the ACOT research teachers had equitable opportunities to do the following:

1. Reflect on prior and present experiences.
2. Have access to technology.
3. Re-think, re-define and reflect on their practices, attitudes, roles, and beliefs about pedagogy and learning.
4. Collaborate with co-workers to talk about standards, interactions, situations, tasks, and tools.
5. Create environments to communicate with students and other staff members.
6. Feel successful with student's progress.
7. Create learning environments for students and for themselves.
8. Act as guides and mentors for students.
9. Re-define and open new opportunities for all students to learn.
10. Plan lessons for real and relevant classroom use.

11. Balance collaborative instruction, inquiry-driven, use computer tools for thinking and solve real life problems, and constructivist knowledge approach.
12. Explore professional development issues.
13. Learn different forms of thinking and communicating for them and for the students
14. Question, challenge, and re-define old assumptions about teaching and learning.

The ACOT teachers were able to move from their traditional views of teaching and learning from instruction to construction of knowledge. Researchers of the ACOT study found a significant change that occurred in the participants of the study as they learned the tools to extend their traditional views of pedagogy and learning from instruction to construction. The following table is a comparison of the findings:

	Traditional (instruction)	**Knowledge Construction**
Activity	Teacher-centered and didactic	Learner-centered and interactive
Teacher role	Fact teller and expert	Collaborator and learner
Student role	Listener and learner	Collaborator and sometimes expert
Learning emphasis	Facts and replication	Relationships and inquiry
Concept of knowledge	Accumulation	Transformation
Demonstration of success	Quantity	Quality
Assessment	Norm-referenced and multiple guess	Criterion-referenced and performance portfolios
Technology use	Seat work	Communication, collaboration, information access, and expression

(Apple Corporation, 1995)

Time after time, researchers have supported the ACOT findings based on interviews, studies, or practical classroom experience. Through research studies, Sandholtz, Ringstaff and Apple Corporation, (1997) and Hughes (2001) also found the creation and exploration of any computer education model for teachers to be crucial for it to be successful, meaningful, and effective to the learner. In the creation or invention stage teachers begin to incorporate technology in their daily lessons to experiment with new instructional tools in ways that are meaningful, effective, and successful for the teacher as well as for their students. The exploration or appropriation stage is where the teachers begin to change their attitudes towards the usefulness of technology.

The ACOT Project was successful due to the components of the program. The amount of barriers was minimized to create a sustainable change in the lives of the teachers as well as in the lives of the students. The ACOT taxonomy is supported by other researchers who investigated how teachers adopt new innovations.

Stages of Concern Taxonomy of Teacher Development

Anyone organizing a teacher development model must take into consideration the Stages of Concern, so that it can be successful, effective and meaningful for teachers. Hall and Hord (1987) through their years of research developed teachers' Stages of Concern, which address the different stages that teachers go through when adopting a new innovation. These Stages of Concern have to do with feelings and perceptions about innovation and the change

process that can be sorted and classified into what people call *concerns* (Hall and Hord, 1987). These stages give people a framework to think about teacher's feelings, concerns and perceptions when faced with a challenge of using computers in the classroom. These stages of concern must be considered and analyzed carefully when planning strategic and relevant teacher's development days.

0 *Awareness:* Little concern about or involvement with the innovation is indicated.

1 *Informational:* A general awareness of the innovation and interest in learning more detail about it is indicated. The person seems to be unworried about himself/herself in relation to the innovation. He/she is interested in substantive aspects of the innovation in a selfless manner such as general characteristics, effects, and requirements for use.

2 *Personal:* Individual is uncertain about the demands of the innovation, his/her inadequacy to meet those demands, and his/her role with the innovation. This includes analysis of his/her role in relation to the reward structure of the organization, decision-making, and consideration of potential conflicts with existing structures or personal commitment. Financial or status implications of the program for self and colleagues may also be reflected.

3 *Management:* Attention is focused on processes and tasks of using the innovation and the best use of information and resources. Issues relating

to efficacy, organizing, managing, scheduling and time demands are of utmost importance.

4 *Consequence:* Attention focuses on impact of the innovation on student in his/her immediate sphere of influence. The focus is on relevance of the innovation for students, evaluation of student outcomes, including performance and competencies and changes needed to increase student outcomes.

5 *Collaboration:* The focus is on coordination and cooperation with others regarding use of the innovation.

6 *Refocusing:* The focus is on exploration of more universal benefits from the innovation, including the possibility of major changes or replacement with a more powerful alternative. Individual has definite ideas about alternatives to the proposed or existing form of the innovation.

Hall and Hord refer to innovation to any new adopted practices or curriculum, in other words, to any change teachers go through. These Stages of Concern were modified and applied in a study done by Atkins and Vasu (2000), who described them in eight stages as it relates to measuring teachers' knowledge of technology usage and computing.

(0) *Contextual*—use of computers in Stages of Concern, negative economic impact, influence on children, health, dependency on computers, de-emphasis of human values, and use of computers in Stages of Concern.

(1) *Information*—learning how computers can be used and how they function.

(2) *Personal*—oneself, personal status, and the opinions others have about them in relation to computing.

(3) *Management*—focus on time constraints, limited or inadequate resources, data integrity, and steps required to complete a computing task.

(4) *Consequence (self)*—the effect the individual's expertise with computers has on himself or herself.

(5) *Consequence (other)*—the effect the individual's expertise with computers has on other people.

(6) *Collaboration*—the coordination and cooperation with others on a particular application of technology in order to have increased positive effects of use.

(7) *Refocusing*—individual has definite ideas about alternatives to the proposed or existing use of computers or a particular aspect of computing.

Cuban (1986) refers more directly to the innovation by stating that "advocates and observers have noted frequently the uniqueness of the computer, both in supplementing and transforming conventional classroom content and skills" (p. 74). Cuban expresses some of the same concerns described in these stages when he writes about computers and teachers. He questions and explains about the nature of the innovation, how it is being introduced, who the users are, how the machines are being used and if computers should be used in the classroom. They all describe teachers' concerns about adopting any new innovation. They agree that teachers go through different concerns before they can adopt and adapt any new technology.

Cuban (1986) was talking about the projector, the television, and the radio, but there is a clear connection to computers as well. However in Cuban's (2001) more recent research found that more and more computers are available in the classroom, but that there is very little adaptation of computers into the curriculum for students' use.

Teachers will go through these stages many different times with each new change. The process which teachers go through will take time and experience. At the same time teachers will go through the different Stages of Concern as well as Stages of Use at different times (Hord and Hall, 1987); Cuban 1986; Atkins & Vasu, 2000). Hughes and Yenkins' (1998) and Evans (1996) agree that change to a new innovation is a process and not a product. This is assumed to be true based on the fact that teachers are people and not objects that can be molded.

In Evans' paradigm he suggests a strategic systemic approach when presenting teachers with the new innovation. This author is suggesting two approaches. These two approaches are rational-structural and strategic systematic. According to Evans the rational structural is an approach to change is rooted in the concept of scientific management based in Frederick Winslow three assumptions: stability, rationality, and structure. However Evans stated that "the strategic systemic begins by challenging rational assumptions about stability and causality" (1996, p. 10). The strategic systematic is rooted in the perspectives of strategic management and systems theory. Evans' strategic approach suggests that strategic systemic is more effective in engaging all teachers in adapting any new innovation. The rational approach will get fewer

teachers engaged, this is because the rational approached is more imposed on teachers; it is more authoritarian.

	Rational-Structural	Strategic Systemic
Environment	Stable Predictable	Turbulent Unpredictable
Organization	Stable Logical	Fluid Psychological
Planning	Objective, leaner Long-range	Pragmatic, adaptable Medium-range
Innovation	Product Mixed outcome	Process Emerging outcome
Focus	Structure, function Tasks, roles, rules	People, culture Meaning, motivation
Implementation	Almost purely top-down Disseminating, Pressuring	Top-down and bottom-up Commitment-building ("purposing")

In order for teachers to adapt and to adopt computers as the new innovation, first the environment, organization, planning, innovation, focus and implementation must be in place. If all of this is in place, then teachers will go through the entry, adoption, adaptation, appropriation and invention stages more naturally as teachers become more and more skillful as well as comfortable teaching and learning to use computers.

All of these frameworks have the following common elements:

- How people adopt any new innovation
- Organizing any program around teachers' needs
- The environment necessary for innovation
- The importance of identifying a purpose

These authors' frameworks all agreed that computer education models for teachers must address these four basic elements. The section that follows explores what some of these models look like.

Program Models

Teachers go through the Stages of Concern as well as through the different Levels of Use when successful models are implemented. It is crucial to teach and to educate and not to train teachers to use computers as problem solving tools (Rieber and Welliver, 1992; Agee, 1985, Caverly et.al, 1997). Educating teachers to use computers is to help them and guide them through the process of adoption and adaptation. On the other hand training teachers to use computers is a short-term fix to tell teachers what the computers do. Caverly and colleagues (1997) state that in Piagetian terms educating teachers to use technology is to help them accommodate new knowledge rather than simply assimilate another process, which is what training does for teachers. "We use the word educating to emphasize the need for teachers to think differently about rather than merely know what to do with it" (Caverly et.al, 1997, p. 56). When any teacher development model includes as part of its main components serving the needs of the teachers, then the success is reflected not only on teachers, but also in the students.

Barnhart and colleagues (1992), MacArthur and Pilato (1995), Brown and Duguid (1992) and Wang (2000) have also found, based on their own teaching experience and research studies, other important components for a program model to be successful. The program model must be about teaching and

learning, the teaching must be explicit, with hands-on experience, the content must be relevant and oriented towards teachers' needs and the design and delivery of the material covered must be oriented towards integration within the curriculum. These are some of the components that any teacher must consider when teaching a group of teachers or a group of young students. At the same time Wang (2000) and Brown and Duguid (1992) believe that teachers need to be learning to use technology within the curriculum and not only be instructed or trained because it is the instructor's responsibility to make sure that all students learn. It is easier to say that all students were instructed, but it must be proven that all students learned the concepts as well as the main goals of any computer education model.

Whether teachers are in the entry, the adoption, the adaptation, the appropriation, or in the invention stage, they must first feel comfortable, later they must be aware, and finally they must be willing to navigate themselves within the new stage (Wang, 2000). In order for teachers to feel comfortable, be aware and be willing they must receive moral and emotional support because any change is like entering a new world, the world of technology (MacArthur and Pilato, 1995; Wang, 2000). Duhaney (2001) states that some institutions have taken an active role in preparing teachers to integrate information technology to support pedagogy and learning, while others maintain the status quo.

Another important component of a successful technology education model for teachers is the process of constantly reviewing and evaluating the goals, the standards and the content of the program. When teachers are encouraged to be

part of the preview as well as part of the evaluation process, then the model becomes more learner centered where teachers identify their needs as well as the relevancy of technology to be used as teaching tools (Agee, 1985; Tarleton, 2001; Maddin, 1997; Kopp and Ferguson, 1996; Benson, 1997; Wetzel, 2001). Teachers cannot only be trained to use computers, but they must be educated about the methodology as well as the techniques for teaching students to use computers as a problem-solving tool (Tarleton, 2001; Agee, 1985; Maddin, 1997; Benson, 1997). Caverly and colleagues (1997) state that educating teachers emphasizes in the need for teachers to think differently about the integration of computers into the curriculum rather than merely know what to do with them. They also state that the problem is not with technology but with the training models because most of them train teachers to simply assimilate rather than accommodate new knowledge.

One of the goals of educating teachers to integrate technology into the curriculum is to create leadership teams that will guide the next generation. Risley (2000) claims that the "Alliance for Teachers Excellence Program" sponsored by Phoenix Arizona Country Day School has transformed regular classroom teachers into teaching and learning technology leaders. The benefits of a learner centered focused on discovery and exploration technology education program model for teachers is the formation of new technology leaders (Tarleton, 2001; Kopp and Ferguson, 1996; Wetzel, 2001; Maddin, 1997; Caverly et. al, 1997; Gura 2001). Duhaney (2001) agrees that when technology instruction is more student-centered, then the student becomes the manipulator

of the environment and learns to practice the principles of teaching and learning with a constructive behavior.

Barnett (2001), a technology researcher and consultant, suggests a philosophical framework, that summarizes all of the main components of a successful, effective, and meaningful technology education program model for teachers to ensure effectiveness and success: (1) Create a Vision; (2) Involve All Stakeholders: (3) Gather Data; (4) Review the Research; (5) Integrate Technology into the Curriculum; (6) Commit to Professional Development; (7) Ensure a Sound Infrastructure; (8) and Plan for Ongoing Monitoring and Assessment.

Apple Corporation (1995) and Barnett (2001) acknowledge the fact that the ACOT research proves that it takes educating teachers how to move from one stage to the next to where they can reach the point where they can comfortable and routinely integrate technology into the classroom. Barnett (2001) states that even when the ACOT research found that teachers' growth goes through the five stages, without a strong professional development program, teachers will not reach the invention stage.

Other researchers support Barnett's philosophy because they have also found in their studies that these components are very important for any teacher development model to be successful (Gura, 2001; Duhaney, 2001; MacArthur and Pilato 1995; Barnhart et. al, 1992; Brown and Duguid, 1992; Wang, 2000; Caverly et. al, 1997; Tarleton, 2001; Kopp and Ferguson, 1996; Benson, 1997; Wetzel, 2001; Maddin, 1997; Agee, 1985). Through their studies or through their

personal experience these people give support and validity to Barnett's main components of a computer education model. Hughes and Yenkins (1998) and Sandholtz, Ringstaff and Apple Corporation (1997) support the ACOT stages, and they also agree that when teachers go through those five stages successfully it benefits teachers and students. However, Sandholtz, Ringstaff and Apple Corporation (1997) also suggest for teachers to receive emotional support in each one of the learning stages and even technical assistance in the last four of the stages.

At the same time all of these components become useful and relevant only when the equity and culture of the participants are taken into consideration. Hughes (2001) argues that all people, not just teachers, can be limited to becoming only consumers of technology instead of creators and explorers when issues of equity are not addressed. He suggests for teachers who are participants of a teacher education program to be creators and explorers with equitable access to technology. Ragsdale (1988) defines "equity" and "equality" as follows: "*equality* stresses such forms as evenly balance, or in the same measure, much as the general public's working definition, while *equity* is linked to concepts such as fairness, impartiality, and justice" (p. 47). In other words, any and all program models must have an equity component to it, otherwise some groups will be having more advantages while others will be less fortunate.

Barriers

Any and all teacher development models must face different types of barriers. Important as it is to pay close attention to the components of a

computer education model for teachers, it is also very important to consider all of the barriers that teachers must face when the model is lacking the important elements. Teachers cannot go through the different stages (entry, adoption, adaptation, appropriation, and invention) of adopting when a program model does not have a strong theoretical framework. The different barriers that teachers face when adopting new technology are the lacks of a strong education model. Certain components must be in place before teachers can accept, adopt, and integrate into the classroom any new technology. When a strong computer education model for teachers is successful, meaningful and effective, then the amount of barriers is minimized.

Here is what researchers (Becker, 1998; Piller, 1992; Moore and Orey, 2000 Fann, Lynch, and Murranka, 1989; Hughes, 2001; Ragsdale, 1988 and Sandholtz, Ringstaff and Apple Corporation, 1997) have found in regards to barriers of successful, meaningful, and effective computer education model for teachers. They found that any computer education model for teacher that lacks the following will not lead towards sustainable change and will not have an impact in the teachers and students.

1. Funding
2. Mentoring
3. Equity and cultural awareness
4. Access to computers in schools
5. Appropriate and relevant equipment as well as materials
6. Higher order thinking, problem solving skills and decision making

7. Appropriate time and location
8. Setting goals and objectives
9. Acknowledging and respecting teacher's knowledge, skills, attitudes and perceptions.
10. Involving all participants in the adoption process

Those researchers have found in the long-term studies that programs are not successful, effective, and meaningful when teachers are faced with many different barriers. Some of the researchers have found that teachers with negative attitudes towards computers will take longer to go through the different Levels of Use as well as the Stages of Concern (Soner, 2000; Milbrath and Kinzie, 2000; Ropp 1999; Fann, Lynch, and Murranka, 1989). These were all positivist studies, which were done to measure teacher's characteristics before and after the study with two different groups of teachers. However, they also found that the teacher's prior computer experience affected their attitudes towards learning any new technology. The technology education model affected those teachers who had negative attitudes about technology. However, they also found that those teachers who have had positive experiences were more willing to move on from the entry, adoption, adaptation, appropriation, and invention stages.

Teachers' attitudes are not the only barrier that teachers must overcome when adopting a new technology. Access to computer labs in the schools, the density and intensity of the technology presented, the time spend in the training, and the relevancy of technology as it relates to teaching and learning can also

present barriers (Becker, 1998; Piller, 1992; Moore and Orey, 2000). Moore and Orey (2000) also stated that another significant barrier is when a technology education model for teachers does not include practical suggestions on behavior management. These are some of the teachers' concerns in why they are not going trough the stages of adoption faster.

Also when teachers' needs are not being met it is difficult for them to accept any new change. Researchers found in their studies that when teachers feel that their needs are being met, then any computer education model can be more effective, successful and meaningful to the teachers (Fann, Lynch, and Murranka, 1989; Becker, 1998; Ragsdale, 1988; Piller, 1992; Moore and Orey, 2000). Those needs range from addressing the behavior management issues, access to computer labs in schools, relevant material to their subjects of teaching, explicit instruction, technical support and/or on-site mentor, personal phobia, experience and efficacy is respected, and individual attention given to the learner, among other needs. These issues should be addressed by any strong computer education program model for teachers. Fann, Lynch and Murranka (1989) state that resistance is the number one problem in learning about integrating computers into the curriculum. They define phobia as believing that one cannot interact successfully with computers and avoiding using computers regardless of their usefulness (p. 308). They also define efficacy as a belief in one's self to be able to use computers (p. 310). They adopted these terms from Bandura who believed that negative attitudes and a

loss of perceived control can influence people's ability to master a particular behavior.

However, many of the researchers stated that based on their studies as well as in their personal experience, going through the entry, adoption, adaptation, appropriation, and invention stages can take teachers many years of practical experience as teachers learn about pedagogy and learning of the new technology (Hughes, 2001; Fann, Lynch and Murranka, 1989). At the same time they also agree that the years of experience in using computers affects teachers' attitudes and willingness to adopt a new technology. Bitter (1994) stated that "novice teachers often have little pedagogical experience to draw upon as they plan and evaluate their lessons, interactively teach, and reflect upon their performance as teachers" (p. 5). He also stated that "in contrast, expert or experience teachers appear to have elaborate and complex teaching schema and highly organized and flexible management skills that allow their students to partake of active learning styles, constructive inquiry, and quality discourse" (p. 6).

Other researchers would disagree with Bitter based on their own studies which have proven that novice and experienced teachers are equally capable of planning and evaluating their lessons, but that only their prior experiences will affect their attitudes when planning or evaluation a lesson, more so if it is about integrating technology into the curriculum (Milbrath and Kinzie, 2000; Ropp, 1999; Yildirim, 2000).

However, the most significant barrier argued by Hughes (2001) is where teachers find that technology limits them to remain as consumers instead of creators or explorers of it. If any computer education model for teachers does not consider the equity and the cultural relevancy component, then it becomes a critical barrier for the learner. It is crucial that these barriers must be addressed because they are the bottom line barriers. There are two categories that he identifies to be barriers are the internalized experience of the learner and the external barriers to learners' control. These two categories have five factors, which determine how a person interacts with technology. Within these equity and culture barriers he identifies five factors that affect teachers to learn a new technology.

The Internalized Experience of the Learner

- Cognitive styles and affective perceptions of learning and using technologies
- Self-identity based on social class and culture

The External Barriers to Learners' Control

- Available resources
- Societal roles and cultural norms
- Education levels and opportunities

(Hughes, 2001, p. 4)

Hughes (2001) states that these factors create the filter, which each person uses to process interaction with a technology. The filters created keep people away from interacting with computers in successful, meaningful, and effective ways. Ragsdale (1988) offers a similar view and notes that:

> It is difficult to draw strong, definite conclusions from such a mixed collection of possible factors and speculation. The main theme seems to be that equity depends on matching the features or strengths of computers to the weaknesses or needs of people. To identify the features, strengths, or even the benefits of computers alone is not likely to be sufficient. Neither is the identification of human needs or weaknesses, by themselves, likely to be sufficient. The successful search for equity, and the determination of its attainment depend on the use and needs assessment and evaluation techniques. Without consideration being given to the ways in which evaluation and equity can and should affect each other, the equity question cannot be described completely, much less solved. (p. 69)

Equity as stated by Hughes (2001) and by Ragsdale (1988) is a significant barrier that must not be overlooked when planning a technology development model for teachers. Sandholtz, Ringstaff and Apple Corporation (1997) agree with Hughes (2001), but they also say that beliefs are constantly changing because teachers are always changing with the educational practices. Hughes (2001) suggests that before developing a plan for technology education for teachers, the training model must be tested against all five mentioned elements of equity and it must come from a clear understanding of the effect that the technology will have on the teachers that will use it.

Cuban (1994) and Hughes (2001) as professors of education and as researchers have found that culture plays a significant role in the adoption of new technology by teachers. Cuban (1994) states that:

> First, certain cultural beliefs about what teaching is, how learning occurs, what knowledge is proper in schools, and the teacher-student (not student-machine) relationship dominate popular views of proper schooling. Second, the age-graded school, invented in the late nineteenth century, has profoundly shaped what teachers do and do not do in classrooms, including the persistent adaptation of innovations to fit the contours of these age-graded settings. (p. 51)

These cultural beliefs about teaching and teachers shape and influence how teachers adopt technology. Hughes (2001) supports Cuban's statement by using Bower's (1988) critique of Papert by saying that, "in this dichotomy (i.e. that knowledge which comes from traditions and human relations) people from a culture which is based on analogue knowledge will have difficulty in adapting to the fundamental processes of computing" (p. 9). Cultural biases certainly are a barrier and a strong computer education model for teachers must take those into account for the program to be effective and successful.

Hughes and Yenkins (1998) state that, "teachers do not change over the course of a training session. They need time, resources, and support in order to adopt and adapt new technologies" (p. 24). The ACOT research proved this to be true with its ten-year research. They minimized the amount of barriers and provided a strong foundation for teachers to adopt and to adapt the new

technology given the fact that in 1985, which is when the ACOT project started, at that time computers were just starting to be used in classrooms. At the same time Cuban (2001) also argues that, "the interplay between historical, organizational, economic, social, political and technological contexts has much explanatory power" (p. 174). All of these elements must be considered before implementing any new innovation. The ACOT researches seemed to have addressed many of these elements before starting their research and that is why their work left a sustainable change on teachers', administrators', and students' lives.

In summary, in spite of their different findings, all of the authors agreed that there are a number of challenges to be faced when creating a computer education program model for teachers. They also agreed that all teachers need continuous support in order to gain a level of proficiency in integrating technology efficiently and effectively for teaching and learning purposes. They also acknowledged the fact that there is a lack of availability and access to equipment, funds for extended education of computer programs, supplies and maintenance/upgrading of equipment, as well as instructional and technical support. These are real factors that none of the researchers can ignore, but yet they all have different opinions on what is more important.

Whichever computer education model people use to educate teachers to become comfortable and skillful in learning and teaching, the goals should always be kept in mind. The main components must be in place as well as a great effort must be put into reducing the amount of barriers. The model must

be guided towards creating sustainable change as well as being effective and useful for all of the participants. At the same time the model must allow for teachers to become leaders of their school to support new users of technology. The computer education model must also provide the opportunity for each learner to be moved up to the next learning level in the use of the new technology. The participants of the computer education model must feel comfortable in teaching and learning about the new technology because this will provide them with the tools to learn new computer skills, knowledge and applications to the classroom.

The Path of a Researcher

Design

This study created a leadership team at my school for future support to other teachers to utilize the existing technology of our school. This project allowed me to be part of a team that moved each one of us to the next learning level. We learned how to utilize the existing computers of our school as well as how to improve our technology proficiency and reduce our computer anxiety. This project also created a team that will discover the needs as well as the solutions to the problems or issues around the use of technology in the classroom. My main purpose for this project was to do a participatory action research project where the other teachers of my school had many opportunities to participate in the decision-making process. We created a community where we learned from each other.

Setting

The research was conducted in the rural school where I work. It is an elementary school with limited technology resources. The school is over 50 years old and it has never been completely remodeled. In 1999 two classrooms were remodeled because they were totally destroyed during a fire. There is a total of thirty four classrooms and only twenty eight are in use. There are fourteen portable classrooms and only five are being used as second and third grade classrooms. Presently the old classrooms have two power supplies outlets for the whole classroom. The old classrooms measure about 30 feet by

30 square feet, in comparison to the portables that measure about 25 by 25 square feet. The old classrooms as well as the computer lab and main office do not have a cooling system. They heating system is over 20 years old and the amount of noise and dust that the fan collects makes students, teachers, and staff have allergies. Most classrooms, main office, and computer lab do not use the heating system, due to the problem with it. Some classroom teachers and the main office personnel bring their own electric heaters from home, or turn on the heaters before or after school hours only.

More than half of the students' population is bussed in from Castroville. The school has 556 students from kindergarten through fifth grade. About 48 of our population is from Mexican descent, 40 percent from Caucasian descent and a very small percentage of Asian, African-American and Arabic descent. This means that at least half of our student population speaks Spanish. Our school has a Bilingual program in place. The school has two kindergarten, two first grade, two second grade, two third grade classrooms with fully bilingual and biliterate teachers. It also has a fourth and a fifth transition class for those students that are not ready to be mainstreamed into English only classrooms and for newcomers.

Over 85 percent of our students receive free or reduce breakfast and lunch. Also over 50 percent of the students' parents work in the agricultural fields or in the packing industry. The other half of the parents work in white-collar jobs such as clerical, nursing, and fire fighting. A significant number of parents who work in menial jobs are illiterate. Most kindergarten through third grade English teachers

have a parent volunteer in their classroom for at least three hours a week. Forth and fifth grade English classrooms and bilingual classrooms do not have parents come to help in the classroom as often.

The school has one computer lab with 28 PC computers and one laser printer. The computers are at least six years old and when they were given to the school they had 2.0 GB of bytes of the local disk space, 120 MB (megabytes) of RAM, 64 bits of memory, and a 264mhz (megahertz) speed processor. The computers came with no CD ROMS, no software of any kind, no Windows 98 system, and no integrated speakers. At the end of the 2001-2002 school year, the administrators were able to allocate funding to purchase external low quality sound speakers, 8X CD ROMS, a license for the Windows 98 program to be install in all of the computers, some licenses for Microsoft Office to be installed in some computers, as well as a license for every computer to be networked to the Accelerated Reader and Accelerated Math Programs. A parent from the school was able to contact a company from San Jose and they donated all of the computer desks and chairs from the computer lab. The school also purchased a computer screen projector, but not a stand for it. It is set in a table with two chairs on top of it and then the projector is taped to the chairs.

The computer lab was recently remodeled to be properly wired for all of the computers to be networked. However, the windows are so small that after the computers have been turned on for more than an hour, the lab gets very hot. The room does not have a proper ventilation system. The room measures twelve feet wide by twenty feet long.

The library has eight computers set on tables and classroom chairs are used when working in those computers. The cables from the computers in the library are covered with tape and with mats because the computers are not properly wired. However all of the eight computers are networked and connected to a laser printer that was donated by another San Jose company. The laser printer has tape in every opening and in every part that can be easily removed. The machine is down every day and the computer support person finds herself spending hours fixing the machine weekly, or sometimes daily. This printer as well as the one in the computer lab is always low in ink or it messes up the papers teachers are trying to print.

There are twenty-eight classrooms and they all have at least one computer. Most lower grade classrooms are set up with four computers in each classroom, except for mine which has six computers. There are some that have one or two computers because those teachers have requested to have fewer computers installed. The computers in those classrooms have less speed, memory and a slower processor than those in the computer lab or the library. Those computers have a 1.0 GB of bytes of the local disk space, 64 MB of RAM, 32 bits of memory, and a 166mhz speed processor. Even though some speed and memory was purchased, it there was not enough funding to upgrade all of the computers. Consequently, only those computers where the whole school has access were upgraded with most updated technology features. All of the classrooms have their computers set up on students' desks and are using

students' chairs. The wires for the computers are taped to the wall and the printers are sitting on tables.

Each classroom has a color printer, even though they are always low in ink and the paper jams daily because the rolls are very old. The office has two fairly new computers with the most updated technology because the district maintains those to maintain school and student records. Both of the administrators have a new desktop computer in their office as well as a laptop. Those computers are upgraded or exchanged regularly, but the laptops were purchased with the administrators' own money.

I am using a pseudonym for the school and for the people. The school was called "Benito Juarez" Elementary. It is difficult for the school's name not to be identified by some readers because those who know me can immediately make an identification; therefore I did not include sensitive information which participants shared during their interviews as part of my findings and reporting of the data. The principal of my school provided me with a letter of acknowledgement and authorization in order for me to complete the project.

Research Participants

In the school there are 26 female teachers and one male teacher. There are five teachers with less than three years of teaching experience, ten with less than fifteen years and eleven teachers with more than ten years of experience. Most of the teachers live within the surrounding cities of the Prunedale Community. They live in the cities of Salinas, Castroville, Prunedale, and Aromas. Some of them live in Carmel Valley, San Juan Bautista, Santa Cruz,

Pacific Grove and Monterey. There are eight teachers who are fully bilingual and biliterate and are of Mexican descent. One of the bilingual teachers is of European American descent, but she is fully bilingual and biliterate and teaches in a first grade bilingual classroom. The rest of the teacher population only speak English and are of European American backgrounds.

All five teachers who are part of the focused group, have a Multiple Subject Credential. All five are female because the only male teacher was not interested in being part of the teaching and learning group. All of them have in their classroom students from different cultural and linguistic backgrounds. The teachers are from two different cultural backgrounds, Hispanic and Caucasian. Their age ranges from 49 to 58 years. Four of the teachers received their teacher education in California and only one from out of the state. Their teaching experienced ranges from twelve to twenty two years. All five participants requested for their names to be kept confidential; therefore pseudonyms must be used for each of them.

Participants' Information

"Lori" calculated to have a total of 21 years of teaching experience, but only 13 of those had been at our school. After she received her teaching credential she took a three-year break to be with her children. This means that she received her teaching credential at least 25 years ago. She had zero computer education in her credential program because computers did exist in those years. She was first introduced to computers when her children were old enough to use one. Ten years ago, she first bought a Mac because her children

were learning about computers in school. She wished for her children to learn to operate the machine and then they could teach her, but it did not happen that way. She found herself not knowing how to operate it, no one was available to teach her and she decided to forget about using computers.

"Melanie" has twelve years of teaching experience. She has worked for the past six years at our school and six years she worked for an independents study program for the same district, as a home-school teacher. She cleared her credential five years ago, but received her preliminary multiple subject credential twelve years ago. The only computer education she remembers having ever received was a single computer class to clear her credential, which was required by the State of California. The class was for four hours during the week housed in a middle school for ten consecutive weeks. She then had to drive back to her house and by the time she got home she felt exhausted and ready to give up with the computer education class. She first had hands-on experience with computers was when she was clearing her credential, but she never learned how to integrated it into the curriculum.

"Susie" began teaching sixteen years ago with the same district where our school is located. She received her teaching credential eleven years ago because she worked under an emergency credential as a bilingual resource teacher for five years before she received her preliminary credential. She enrolled in an internship program for five years while working on her credential requirements. Before she began teaching she worked as a temporary secretary and one of the jobs working in the office was setting up reports in the computer.

When she was not busy working on the computer she was experimenting until she knew enough to use the program comfortably. She also learned to use the software tutorials. The computer class she remembers having taken was through Chapman University when she was clearing her credential. She bought her first computer in 1998 when her daughter was in middle school. The computer course through the university was a one semester long, during the evening from 6-9 p.m. She felt exhausted after class because she had been at work all day and then had to attend this computer class to clear her credential.

"Claudia" has been teaching for the past 20 years because she took a six years break when she son was young and needed her the most. She received her life-time credential 26 years ago. She enrolled in an internship program, while working in her credential for a year. Computers did not exist 26 years ago, so she did not receive any computer education while she attended college. She bought her first computer about ten years ago because her son and her husband needed it. She did not have to renew her credential because life-time credentials are valid for the entire life of the teacher. Now, Claudia has three computers at home, one for her son, one for husband and one for her to type letters and memos. She has taken brief computer classes during some of the in-service days that the school has provided, but they are only one time for an hour every beginning of the school year. She has also tried by attending a class at the school, but it was for 2 hours every week and she felt too tired to keep going. She also felt that the class was crammed with too much information at the same time.

"Briana" received her teaching credential 19 years ago and has been at the same school for the past 16 years. She did not receive any computer education in her credential program because computers were in its early stages of existence. About fifteen years ago, her husband and her daughters began learning about computers, but she did not feel ready to use them herself. She perceived her family to be very advanced in technology and she was feeling left behind. A couple of times she attempted to learn more about computers when the principal of the school and a teacher offered to teach them about technology. It did not work for her those couple of times because the class was full of information and the timing was too long. Some times she has attended the one-hour workshops provided during the in-service days before school starts, but she finds the information provided irrelevant to what she needs to learn. She was fearful and did not want to take the time to learn more about computers more formally and consistently.

This is a brief description of the participants of this study. They have all had different computer experiences, skills, and knowledge, but at the same time they shared many things in common. They had been teaching at the same school for more than ten years, they had desires to learn about computer and they also shared similar needs for an effective, useful, and meaningful computer education program model.

Data Collection

How I Explained the Project to the Teachers

I explained to all teachers present in a Monday staff meeting about my thesis topic, purpose, design and any other information related to the study. I asked for volunteers who might be interested in taking the online computer assessment. Seventeen teachers volunteered to take the online assessment. I am identifying this larger group as the "process group." All of the seventeen teachers were part of the teaching, learning and decision-making process, but I focused my study on those who showed low performing skills, knowledge and computer application in the California Technology Assessment Profile (CTAP). I am identifying this small group of teachers as the "focus group." Therefore, this project had two groups, a focus group and a process group and I worked closely with the focus group of five members.

Anyone who took the online assessment could be part of the project, but they would be free to choose to continue or to stop after they took it. All seventeen volunteers took the CTAP, which assessed their general computer knowledge and skills about the Internet, e-mail, word processing, publishing, database, spreadsheet, presentation software and instructional technology. After they took the assessment only five of them were interviewed and their interviews were recorded. All of the teachers who were willing to be part of the process of creating a computer education program model were welcome to be part of the group, however I made it clear that not every one was going to be part of the focus group. I explained to them that those who performed the lowest in most areas of the CTAP assessment were going to be the participants of the focus group for the research. They knew that through the results I was going to

be able to obtain more information about their computer knowledge and skills at the beginning as well as at end of the research. I explained that I was going to select five teachers who had the lowest level of performance in the CTAP, but only if those five volunteered to be part of the study.

How I Worked with the Process Group

The process group and I had meetings before the in-service was provided to identify their areas of need as well as how they wanted those issues to be addressed during the in-service. The intermediate to advance computer skills level group had their own schedule and needs, so I worked with them separately. The in-service for them was provided in small groups of two to five participants at a time to provide the participants with individual attention and quality teaching. At the end of the class we discussed any future topics to be covered, answered any questions or clarified any concerns that teaches had for each other. The work and material covered always led towards teachers' desires, interests and needs. The goal was set for 20 minutes, but they always ended up staying for 30-40 minutes. The computer education provided was guided by all of the participants because everyone was participating in what they are interested in learning.

The process group selected a book titled Learning Microsoft Office 97 (Blanc and Vento, 1997). This book was selected among three other choices because it had visual examples of the computer screens, short lessons, commonly used English, instead of computer jargon. The process group received a copy of each lesson every time we met. I provided whole group instruction during the

computer education sessions. I also provided some follow up individual instruction for teachers who needed the extra help during lunch time. By doing this, I felt that the issue of equitable support was being addressed appropriately.

How I Worked with the Focus Group

Maxwell (1996 p. 21) suggests three practical purposes for doing qualitative research. The first is to generate results and theories that are understandable and experientially credible, both to the people you are studying and to others. Second, conducting formative research helps to understand the process by which things happen in a particular situation rather than to rigorously compare this with other situation. The third purpose is to engage in collaborative or action research with the researcher and the research participants. These three practical purposes were part of my goals because I was working with the participants to identify the areas of computer need and interest and then we all formulated solutions that were meaningful to all of the participants of this study.

I selected a focus group because it helped us create a goal, create a process for participation and create positive results for the participants as Maxwell suggests. The group of five teachers, who were the focus group for the project, I interviewed and kept a memorandum of their activities and progress. Like the process group this group had its own needs and therefore we created accommodations to meet those needs.

For the focus group the computer education class was provided every Thursday and Friday after school for twenty to thirty minutes, which was what the teachers decided. I kept memoranda of our meetings and a calendar of our

meeting dates and activities (see Appendix C). I placed reminders every Monday and then on Wednesday to remind them of our next meeting as well as to let them know the topics to be covered that week.

I interviewed five teachers in the focus group and asked them questions related to their computer comfort level, skills, computer uses in the classroom, computer education experience, among other related topics (see Appendix A for the list of questions). I asked them a total of thirteen questions during the first round of interviews and a total of nine during the second round of interviews. The nine questions were the same as the last nine questions from the first time they were interviewed. Fetterman (1998) points out that, "experienced interviewers will ask non-threatening questions to develop a healthy conversation around sensitive issues" (p. 39). My advisor guided me through the process of developing questions that are non-threatening and that could help me to develop a friendly relationship with the interviewee.

The questions that I created had the how, what and why, so that the participants did not give me a yes or no answer without further explanation. Emmerson, Fretz and Shaw (1995 p.146) also encourage researchers to create questions that will draw on a wide variety of resources such as the participant's life experience, memories of specific incidents or events, concerns and orientations towards certain issues or descriptions of prior experiences or events. My questions were framed to obtain enough information from the participants to substantially and accurately inform my research. I used Emmerson, Fretz and

Shaws' suggestions on framing questions to obtain cause and effect answers from the interviewees and avoid the yes or no responses.

Interviewing the focus group was my most important data collecting technique. Fetterman (1998) says that, "interviews explain and put into a larger context what the researcher sees and experiences (p. 37)." This technique allowed me to understand the participants' experiences and attitudes towards using computers. Fetterman (1998) also suggests for the researcher to choose one of the different types of interview styles, which are: "informal, semistructured, structured and retrospective" (p. 37). I conducted the interviews in very informal settings and somewhat semistructured because I had a set of questions to guide the conversation. It also had a semistructured because the interviews were limited to a maximum of 30 minutes. The interviews were recorded and then transcribed. My advisor guided me to develop thirteen questions for the interviewees. I kept a calendar of the days the participants of the focus group and I met and kept memoranda to record the topics we cover during the computer education classes.

All interviews were audiotaped and then transcribed to accurately collect all of the information. Also, a consent form was signed to give me authorization to use the information collected from the interviews as well as from the meetings. The first interviews were done during the first week of October and the last ones during first week of February.

Instruments

In preparation for this study, I assisted 17 teachers in the school to complete the California Technology Assessment Project (CTAP) assessment on line on April 30th and May 3rd of 2002. This assessment provided information about their current computer knowledge, skills and classroom application. This assessment was suggested by my advisor to be a reliable and useful tool for my study.

According to the information provided by the CTAP website, in December of 1998, the Commission on Teacher Credentialing adopted a new technology standard for Multiple and Single Subject Teaching Credential candidates.

The assessment web site had the following items:

- Assessment Questions
- Personal Summary Chart
- Site, district, county, region, state and comparison charts
- Personal and Site Resource Catalog
- Rubrics
- CTC Technology Standards, IST and NETS Standards for Teachers
- Personal Environment

The assessment section requires of teachers to set four digit identification and a password to begin answering the questions. The identification digits as well as the password could only be modified by the user or by those who had access to the information of the teacher. The assessment questions were

related to teachers' General Computer Knowledge and Skills on the operation and maintenance of computers. Those questions were also about their knowledge and skills on Internet, E-mail, Word Processing, Publishing, Databases, Spreadsheets, Presentation of Software, and Instructional Technology. The questionnaire had 75 questions total and they were multiple choice. The answer choices varied from question to question. Some choices were more vague and others were more direct and specific to the question. The assessment can be taken as many times as a teacher wants.

The personal summary chart shows a bar graph of the introduction, intermediate, or proficient level for each of the assessed areas. It also provides a comparison of the assessment results from the different times taken. The site, district, county, region, state and comparison summary chart show a pie graph with information about how many teachers, schools and districts had taken the assessment. It also shows the average of the overall levels. The resource catalog provides a list of the recommended type of resources, for the individual as well as for the site, for each of the assessed areas on the general computer knowledge and skills. It recommends a variety of resource types such as online education, workshops, multi-day sessions, among other computer related resources.

The individual assessment results were kept private. No person had access to those results, unless teachers shared their password or shared a printed copy of their chart with someone else. All results charts and reports for a school, district, county, region, and state were aggregated for all of those who

participated. The aggregated assessment or survey data of the CTAP were used to help plan, monitor, and evaluate technology professional development programs in schools, districts, counties, regions, and even at the state level. The results were also used when applying for state or federal grants. The data was also used to plan, monitor, evaluate and justify the need for funding teacher education programs. There were six regional CTAP representatives with different counties under each one of the regions.

The rubrics described the three levels of proficiency: introductory, intermediate, and proficient based on the California CTC (Commission on Teacher Credentialing) technology standards, the ISTE (International Society for Technology Education) standards and on the NETS (National Education Technology Standards) standards for teachers. The California CTC has mandated that candidates for California teaching credential in 2001 or later have a level I and a level II technology knowledge and skills. The CTC laid out in detail what the candidate must be able to do in each one of the levels. The ISTE is a world wide non-profit organization that is dedicated to promoting appropriate uses of technology to support and improve students', teachers', and administrators' learning in K-12 education. The NETS have been adopted by 44 states to enable stakeholders in PreK-12 education to improve and facilitate the learning of educational technology in the schools of the United States. The NETS defines the standards for technology and curriculum integration, students' assessments and evaluations, technology support for students, teachers, and administrators.

The assessment has categories and sub-categories for each assessed area. For example, for the Internet category the sub-categories are: General Knowledge and Skills, Communication and Collaboration, Research Tools, Ethics and Policies, Information Literacy, and Integration, Student Learning, and Classroom Management. Each of the sub-categories had a link to the CTC Technology Standards and/or IST NETS Standards for Teachers.

Data Analysis

After I collected both of the CTAP bar graphs from the teachers, I looked for trends of change in their computer knowledge, skills and abilities from the first time they took the assessment in comparison to the second time. In those bar graphs the first thing I looked at was the knowledge, skills and abilities of each teacher in all of the nine areas assessed from the first time they took the assessment. Secondly I looked at each of the assessment categories, taken the second time, such as word processing and basic knowledge about computer maintenance and trouble shooting to see if there was any change from the first time to the second time they took the assessment. The second bar graphs I obtained from the teachers was the comparison bar graphs that showed me the comparison from the first to the last time they took the assessment. Those bar graphs provided clear trends of change in their computer knowledge, abilities and skills.

Given the goals of this study the interview questions indicated in the appendix are appropriate because they are opened ended. Emmerson, Fretz and Shaw (1995 p. 147) suggest to frame questions that get at how the participants see the

experience events, at what they view as important and significant, at how they describe, classify, analyze, and evaluate their own and other's situations and activities.

I also analyzed the interview data by selecting themes and sub-themes. I triangulated the information obtained from CTAP bar graphs and the interviews with the literature review. After I transcribed all of the interviews, I used the grounded theory approach to let the themes emerge. I color coded the most significant and meaningful themes that emerged from the interviews. In other words those were themes that were expressed by the participants of the study. I grouped their responses according to the themes and that had emerged from the interviews. I compiled the themes and analyzed them carefully to see if their responses were similar to each other or if there were isolated responses.

The interviews, the CTAP assessment and the literature from other researchers allowed me to triangulate the research. According to Fetterman (1998), researchers used a variety of literary conventions to make their research more meaningful and effective. Triangulation was be particularly important for the data analysis of the research. Fetterman (1998) said that, "it is at the heart of ethnographic validity-testing one source of information against another to strip away alternative explanations and prove a hypothesis (p. 93)." It was important and necessary for me to use more than one source of information to protect the validity of the data collected. Also, by comparing and contrasting information the quality of the analysis of the data was more credibility. I used other literature from experts in the field to provide various source of information when analyzing

the data. The findings of this study are presented in the next chapter of this work.

Teachers' Interactions with Computers

This study had a focus group of five multiple subject credential teachers working in a rural school with limited technology resources. I was interested in finding out how teachers from a rural school with limited technology resources can be educated in successful, meaningful, and effective ways to use computers. At the same time I wanted to find out how computers can be used as a tool for teacher needs, and for instruction, and how teachers can improve their computer knowledge, skills, abilities and comfort level.

In this chapter I present the findings on teachers' computer knowledge, skills and abilities based on the CTAP. Based on the interviews, several themes emerged such as the ways in which teachers and students use computers, teachers' attitudes towards computers, successful, meaningful, and effective computer model components that worked best for teachers, and the barriers that teachers faced when trying to adopt and adapt a new innovation, in this case computers.

California Technology Assessment Profile (CTAP)

Findings

All of the participants answered all the questions of the CTAP assessment the first time, but they only answered two sections in the second assessment. The questions were related to their computer knowledge and skills on trouble shooting and naming some computer components, the Internet, email, word processing, publishing, databases, spreadsheets, presentation software and

instructional technology. There were 75 questions total in all of the sections of this assessment. Each of the sections has one to four sub-sections and that is why there was a large number of questions. Graphs comparing each of the participants' first and last assessment of their computer skills and knowledge are in Appendix B.

The CTAP levels were introductory, intermediate and proficient. In the CTAP the introductory level was a number one, the intermediate a level two and a proficient a level three. However I divided the each section into three sub-categories. By doing this the introductory level became levels one two and three, the intermediate levels four, five and six, and the proficient level seven, eight and nine. I divided those three levels into beginning introductory, intermediate introductory, and existing introductory. I did the same thing with the other two levels the proficient level had introductory proficient, intermediate proficient and exiting proficient and the same labels for the intermediate level. Consequently, to me the beginning introductory became a number one, the intermediate introductory level a number two, and the exiting introductory level a number three. I subdivided them because it was easier for me to classify teachers that way. I did this because I felt that those three categories were too vague and not specific enough for me to analyze the results.

The overall CTAP results, in the first assessment, showed that all five teachers had an introductory level on naming the parts of a computer, and some trouble shooting and word processing. Four of the five teachers were at the introductory level in their knowledge and skills in using the Internet, email, and

publishing. Also only one of the five teachers showed no level of knowledge and skills about the Internet and email.

At the same time only one of the participants showed an exiting introductory level in her general knowledge and skills in naming the computer components and doing some trouble shooting. Three of the five teachers showed a beginning introductory level in their publishing skills and knowledge. The other two teachers showed no knowledge and skills in the publishing section. During the first CTAP assessment none of the teachers showed knowledge and skills about databases, spreadsheets, and presentation software. Only one had some minimum knowledge and skills about instructional technology.

Two of the five participants showed an exiting introductory level in their word processing knowledge and skills. Two had a beginning introductory level and only one had an exiting intermediate level in their word processing skills and knowledge. All of them had some knowledge and skills in the word processing skills because it seemed to be the most popular program used by most people.

During the second CTAP assessment, only one teacher took the entire assessment because she felt she had learned some things in the areas of spreadsheets and instructional technology. After she answered every question of every section of the CTAP assessment, I suggested to the other participants to only take two sections of the CTAP assessment since we had only worked on two of the sections during our computer sessions.

In the second assessment the participants only took two sections of the CTAP assessment, the general computer knowledge and skills and the word

processing areas. I made this decision due to the number of topics covered during the computer education sessions. The skills and information covered during those sessions was suggested and agreed by the five participants and myself.

During the last assessment all five participants answered the questions about their knowledge and skills on word processing and naming the computer parts and trouble shooting. All five teachers showed a significant and meaningful trend of growth in those two areas. Four teachers in naming computer components and trouble shooting, initially, moved up to the exiting introductory level. The one teacher that was the beginning intermediate level moved up to the intermediate proficient level.

In word processing they all also showed a significant growth in their knowledge and skills. Of the two teachers that started at the beginning intermediate level, one moved up to the beginning proficient level and the other one moved to the intermediate proficient level. Of the two the participants that had scored at the beginning introductory level, one moved up to the intermediate proficient level and the other one moved up to the beginning proficient level. The only teacher that started with exiting intermediate word processing skills moved up to the exiting proficient level.

In conclusion each teacher made a significant growth in learning new skills and gaining new abilities with the computers. Their learning and professional growth was different for each teacher, but at the same time very important. The differences in their growth of knowledge about computer use in the classroom

and for their personal needs was due to several different reasons such as practice time, professional and personal responsibilities, among other reasons.

Trends from the Interviews

The trend found in the CTAP assessment was very significant and the interviews supported that trend. However the interviews provided other vital information about teachers' computer perceptions and attitudes towards computers. The participants answered thirteen questions the first time and nine questions the second time. The content of the questions were the same, but the number of questions changed (see Appendix A). During the second interviews I asked them the last nine questions out of the first thirteen. The interviews also provided crucial information about the computer components of a successful, meaningful, and effective computer education model for those teachers. At the same time information was obtained about the amount of barriers that the participants must face when attempting to adopt and adapt new computer skills and knowledge.

Ways of Using Computers

When teachers were asked what computer programs and features they used more often they responded that, in the classroom as well as at home, all five used Microsoft Word at least once a day for parent newsletters, class lists, to create a student's worksheet, to maintain students' test records, and to make notes for the students, parents or other people. Susie stated, "I use Microsoft at home, mostly daily. I use it to prepare worksheets for the classroom, letters home, activities for school, or to enter results from students, or to rank the kids in

the classroom and to look up a the scores". Four of the teachers said that all of their notes, newsletters and other documents were set up in paragraph form, only one had learned how to do it in columns because the computer support person at school had recently taught her. However, even though they used word processing more often, four expressed having minimum knowledge in what the program can do for them, other then typing words. Only one of them had some knowledge about changing the font style and size. The other four teachers did not change any of the document settings because they had someone else preset the documents for them and they would only make changes as needed.

All of them mentioned having a CD software that came with their language arts program to support all reading levels, but none of them knew how to use it because they never received any type of in-service on how to operate the software, or even how to install it into the computer system. Lori expressed concerns about the fact that she does not know how to navigate her language arts CD ROM from Open Court. She also said that it was unfortunate that students were not using computer software because she was told that it was an excellent program that had simple letters, sounds, and words games in there, which can re-enforce what she had taught her students. Four of the teachers did not know how to install computer software into the computer and only one teacher had learned how to do it from her oldest daughter. Two of the five participants mentioned, during both interviews, teaching their children how to use a software program.

Only one of the five teachers said that her students use the Accelerated Reader software, but that the children knew more how to use than she did. The Accelerated Reader program is a computer software program that has comprehension questions for different readings titles as well as for different reading levels. The children read a particular book more than four times and then they log into the program to select the book they read and they answer the five or more questions about the story. Those questions supposed to test their comprehension of the book they read. Before they take a quiz the program asks the children to choose an option of whether they read the story by themselves, someone read it to them, or they read it to someone else. After they take the quiz the computer shows how many questions they got right and how many they got wrong. It also shows them a percentage based on those five or more questions. The students can also go back and check which ones they missed and the computer will tell them what they correct answer was and will also show them what answer the student chose. The program keeps a record of the books the students have read and the percentages they have received. The teacher can print certificates of accomplishment whenever the teacher decides to print one, even if the student only took one test as long as the student received a 60 percent or higher on the quiz the computer will generate a certificate. A 60 percent on any quiz is considered a passing score for the Accelerated Reader program.

This program was set up in each of the computers through the network. It was set up by the computer support person from our school by setting an icon

on the computer desktop for students and teachers to have easy access to the program. In other words a CD ROM is not required to use the program. The Accelerated Reader software was a program adopted by the district and used in many English only classrooms in my school. This program was for first through sixth grade students to help them develop their comprehension skills. The comprehension quizzes were leveled from the lowest level, .6 level for first grade, through the highest level, 6.0 for sixth grade level. There are higher reading comprehension levels, but our school does not have those installed in our computer system. There might be higher levels of this comprehension tests, but our school only purchased licenses for first through sixth grade levels.

Another teacher said that towards the end of the school year her students used a computer software called Jump Start. She had a parent volunteer come to help her manage the class when students were using the computer. This response was based on the second interview, after almost four months of computer classes. Melanie said

> "I have four computers in my classroom and three of them I have set up with activity games like Jump Start First Grade, Jump Start Second Grade, and Jump Start Reading and since kids are different, different children's work on different computers, depending on their level and they rotate turns. Sometimes they all have chance to work. The fourth computer is used for Accelerated Reader because it has the right comprehension level for all the students. It gives them a chance to work at a higher level and children who are lowest in my classroom work on the

jump start reading and it just focuses on reading and I have them grouped to accomplish most of my plans".

However at times only those who finished their work sooner got a chance to use the computer. She tried very hard for all students to use it, but sometimes it seemed impossible due to the pressure of moving the academically lower students to reaching standards. This teacher felt guilty for not having all students use the computers all the time, but she felt that she had other priorities that had to be addressed first.

In conclusion every teacher had different ways of using computers in the classroom or for personal use. The use of those computers was based on their computer knowledge, skills, abilities, and attitudes towards the machines. At the same time, the demands and the complexity of the profession influenced the ways of using computers in which teachers used computers with the students or for their personal needs.

Attitudes Towards Computers

Even though all of the five participants of this study were veteran teachers, they all showed a significant amount of interest in learning about computers. They stated in the interviews that computers are the future of all jobs. Lori felt that everyone was passing her by and she saw her students knowing more than she did. She did not want to stay behind and wanted to learn more on how to use the computer, so her work would look more professional. They also agreed that children as well as teachers must be up to date with the newest technology.

When the participants found themselves with challenging situations they had different reactions towards finding the solution to their problems. Four of them said that they experienced a great deal of frustration when they could not find a solution. Claudia said, "See all of these stumbling blocks that I have to jump. Unfortunately, this makes me quit because I don't have much time to deal with it." Only one teacher said that she tries to find help from a co-worker, her daughters, her husband or any other person who she thought had more computer skills and knowledge. They all said that at some point or another they do seek assistance when the job must get done and cannot wait.

During the second interview four of the participants found themselves "exploring" the HELP button from the program they were using and only one continued to get frustrated with the computers and ended up shutting them down. Melanie said,

> "I try a couple of different things and if it does not work, then I usually ask. If I am home I ask my daughter, if I am here I come to you or another teacher. I have become more confident with using computers, especially the tool bar at the top and finding things there where things can be if I don't remember immediately where to find something. That is usually what I do. I feel more confident than before about that."

They also began to use some of the computer vocabulary such as TOOL BAR because before we began the computer education sessions none of them knew what it was called or how to display it on their word processing screen. Briana stated, "with the security of this class, I love the commodity of people is

like all are at the same level and so, I am learning to be a risk taker and have less fear of goofing off. I am learning to free explore. If I do not know something I just keep clicking until I get to something I know". All of the teachers used the words *explore, confident, and less fear* to express their new level of comfort with using computers.

At the same time all five participants said that after reaching a higher comfort level, they look for help in the computer, at home or in the school. At least, after the sessions, they were not giving up as easily as before we began. All five teachers also made reference to the copies of the lessons they received from the computer sessions as a source of information when needing help. Lori said,

> "I like the copy that you have because those are really easy to read, those sheets that you have to take home to be put by my computer, then I can refer to it. I am hoping eventually, I can bring myself up and I won't need the visual, but for right now sometimes I need to go back to remember where do find this, where do I find that, so the paper work helps just like a quick little aid".

The visual aid was a suggestion from all the participants when we met at the beginning of the study. They suggested that they get a copy of the lesson each week, so they could use it at home as a reference when needed. All five participants felt they benefited from having those simple one page lessons with pictures and simple English words on how to follow the directions.

During the first interview, when teachers were asked what were some of the ways that they had tried to find solutions to their computer difficulties, three of them said that they quit after trying one or two things they know. Claudia said, during the first interview, that after trying a couple of things she was ready to "break the whole thing". After the many computer sessions, Claudia answered the same question very differently. She stated:

> "When I have problems with the computer I come to the computer parent from our school, but if she does not get back to me I ask somebody else. I do not turn the computer on and off any more because I think that is not good for the computer. I also ask my husband or look at the papers you gave us to see if anything is there that can help me".

Before and after the computer education classes, the participants' overall attitudes towards computers and personal perception was positive, but they showed some frustration due to the amount of barriers that they had to overcome.

Two of the five participants viewed computers as machines that caused more trouble than help. Claudia stated that the "dumb computer" pops a message saying that she had committed an illegal act and it will not let her or the students continue taking the comprehension quizzes, when using the Accelerated Reader program. Another teacher said that when the printer printed "garbage" she did not want to deal with it any more and would rather do the work the old fashioned way, which was doing it by hand. The other three teachers viewed computers as useful tools to help them make their work look more

professional. They also wanted their students to use them more often in the class, but they felt that many times the students knew more about the computers then the teachers.

All of the students receive computer instruction for four weeks, close to the end of the year, by the computer support person. All five teachers felt that since students go to the computer lab for four weeks, then they at least have an opportunity to be exposed to the use of computers. Briana said:

> "In the computer lab they learn to use the Microsoft Word, in respect that they write their names. They also learn to write the words and then they also do drawing, they draw a picture, use color and the computer lady has them change the color of the letters".

However, three of the five teachers wished that their students could use them in the classroom too and not only in the computer lab because that would be them more practice and knowledge computers.

Overall, teachers' attitudes towards computers was positive, but it is a fact that their prior experiences affected their perceptions about themselves as computer users. Those experiences also affected their interest in learning more about how to utilize computes in the classroom or for personal use. All of the participants of this study were willing and were interested in learning more about computers but they certainly wanted to be part of the learning process.

What Computer Education Model Components Work Bests?

When teachers were asked what components of a computer education model worked best for them they responded in similar ways. All five of them agreed that they preferred to have the computer sessions on site once a week for 20 to 30 minutes. Briana said, "for number one, I like the one day a week, I love that consistency, and number two it is the appropriate amount of time. That 20-30 minutes that is all my brain can take at the end of the day, so I seem to be able to actually master more that way". The fact that most computer education courses are offered in far away places such as MCOE (Monterey County Office of Education), CSU San Jose, or UC Santa Cruz, made it really challenging for any of them to feel encouraged to attend to those sessions. Briana stated:

> "It is the hugest blessing for all to have the training on site because it is such a pain to go in a car because of our community the way it is situated, you would have to drive 30 minutes to one town or 30 minutes to another and then to learn for 30 minutes or more and then 30 minutes back, whenever going home, it is just not the best, but having you here is a blessing".

Even though some teachers live near those places where the computer sessions are offered, they felt it was tiring to get in the car and drive to a classroom to learn at the end of a long teaching day.

They also agreed that having a mentor on site was very helpful because knew who to run to when they encountered a new computer problem. Lori

stated, "having you here is the number one for me because any time we have a problem, like just a few minutes ago, we can come running to you, so that is wonderful". They also liked the fact that we were covering topics of their interest and that their needs were being considered at all times. They liked to attend to short sessions that do a little bit of review each week as well as a brief introduction of new concept. All of them agreed that they preferred not to be forced to attend because it takes off the pressure and the stress.

All five teachers expressed at the beginning of the computer sessions their desire to be part of small groups, no more than four people at a time. Susie stated that she enjoyed the small group because she felt that she was receiving individualized attention. She also said that being part of a group where everyone had the same skills, knowledge and abilities gave her more confidence and made her less afraid of "goofing off" or making a mistake. All five participants liked the projects we did in class, which was work they wanted to get done. One time we created a table with narrow and wide columns and rows in the same table. We also created a list of students and added bullets, numbers, and symbols, and even alphabetized them.

Another component that all five teachers agreed with was the leveled groups. Most of them had the same computer knowledge and skills. In most computer courses offered in other places the computer knowledge and skills of the students vary from the introductory level all the way up to the proficient level. Claudia said, "I think MCOE may have computer coursers, but it maybe too advanced for me, I don't know if they'll have that low for me". When teachers

feel that their knowledge and skills are too low and that they are holding back other students in the class, then they begin to feel uncomfortable in the class. It was for that reason that there were two groups, one on Thursday and one on Friday after school, to provide them with the maximum comfort level and personal attention. Briana also stated that she felt very comfortable in the group because there were not people that were ahead of her in the skills and knowledge covered in the computer sessions. One of the goals created by the group was to create a safe and comfortable environment for everyone.

In conclusion, the components of the program model were accepted by every participant because every one's input was considered at all times. Every component was discussed at great lengths to make sure that all of the areas of concern were being covered. Even though the amount of time spend in our weekly meetings was limited, it was used effectively because it was a small group and every one respected teach other.

Barriers for Teachers

The barriers mentioned by the teachers were almost the same, as if they had copied each other's words. All of them agreed that when the machines break down and they do not know what to do about it, then they would rather not turn on the computers again until someone comes to fix them. Another problem that four of them talked about was the fact that when the printer runs out of ink or is very low in ink, they have to wait until the computer support person comes to re-fill them. Claudia stated, "sometimes the printer prints goofy stuff and other times I need to get ink, it's just frustrating because I don't know how to put the

ink in there". None of them have learned how to re-fill the ink cartridges and they did have access to the re-filling kit either. All five stated that it was a real problem to have that many computers around the school and a part-time computer support person.

When teachers were asked what kinds of things they do when they are faced with a problem, they had many similar answers. All five teachers run to ask their children. Susie said, "first, I try and fix it up my own and if that does not work I call my daughter and if she does not know how to it, I ask someone else for help, but if that does not work then, I do it the old fashion". Only four of the five said that sometimes they also go to a friend, who they think knows more about computers than they do, and ask for help. Only two of them tried to navigate around to find the solution to the problem and many times they access the HELP button from the program they use more frequently. Lori stated:

> "I go up to the HELP button, that is usually the first thing I do, but if I have the time I try just to go down each item and try to look for the answer of how to do it. I play around with the computer for a short time and then I just go seek some professional help either at school to the computer technologist or to you".

The other three teachers said that they would rather shut down the computer to avoid more frustration. During the second interview teachers seemed to be more willing to go ask for help or to explore other possibilities to overcome some of their barriers within what the computer can offer and do for them.

Another barrier mentioned by three of the four teachers, during the interviews, was the fact at the school some times there is no one to help them find solutions to their computer problems. Claudia stated that it was frustrating to have a computer problem and not find anyone at school who can help her.

Overall, all of the participants made significant progress in the areas we worked on during those six months. The barriers were minimized, therefore their anxiety and fear was lessen. The teachers' comfort level, their computer knowledge, abilities and skills improved significantly. There was a trend of change in them as well as in me. They learned about computers and I learned them and about how to work with a group of experts in the field of teaching young children in public schools.

Connecting the Dots

In this study I wanted to find out how can teachers from a rural school with limited technological resources be educated to use computers in effective, meaningful and successful ways. At the same time how can they use the existing computers of our school for personal tools or for educational tools in the classroom. To answer these questions I used the California Technology Assessment Profile (CTAP) as well as interviews with the participants. Also for six months the participants and I had computer sessions together once a week for a maximum time of thirty minutes. In this chapter I will explain about the connection of my research findings and the literature. The connections will deal with the ACOT Taxonomy on Levels of Use, the Stages of Concern, the barriers, and the program model components I recommend for continuous use at my school.

ACOT Taxonomy on Levels of Use

According to the Apple Classroom of Tomorrow (ACOT) taxonomy on levels of computer use, all five participants of this study were in the "entry" level at the beginning, which is where they know the basics of using the new technology. At the end of the six months almost all of the teachers were at the "adoption" level, which is where teachers begin to use new computers to support traditional instruction. Most of the participants began to use computer software in the classroom while the others were beginning to consider it and were very much interested in starting to use computers with their students. The goal of the

group was for all of them to someday be at the "adaptation" level, which is where teachers begin to integrate computers into traditional classroom practice. At this level teachers often focus on increased student productivity and engagement by using word processor, spreadsheets, graphic tools among other educational technology.

In the process of working with the participants of the study we used some of the strategies used by the ACOT researchers. We were able to do the following:

- Reflect on prior and present experiences.
- Have access to technology.
- Re-think, re-define and reflect on our practices, attitudes, roles, and beliefs about pedagogy and learning.
- Collaborate with co-workers to talk about standards, interactions, situations, tasks, and tools.

This type of strategies helped all of us to move to the next learning level and levels of computer use such as the "adaptation," "appropriation," and the "invention" levels. In the "invention" level teachers focus on cooperative project-based and interdisciplinary work-incorporating computers as needed and as one of many tools. In the "invention" level teachers discover new uses for technology tools, for example, developing spreadsheet macros for teaching algebra or designing projects that combine multiple technologies. The next steps to follow will help us to move to the next learning level.

- Create environments to communicate with students and other staff members.
- Feel successful with students' progress.
- Create learning environments for students and for themselves.
- Act as guides and mentors for students.
- Re-define and open new opportunities for all students to learn.
- Plan lessons for real and relevant classroom use.
- Balance collaborative instruction, inquiry-driven, use computer tools for thinking and solving real life problems, and constructivist knowledge approach.
- Explore professional development issues.
- Learn different forms of thinking and communicating for them and for the students
- Question, challenge, and re-define old assumptions about teaching and learning.

The process of following these strategies to reach the next learning level is a long process, but it was our main goal that whatever we did had to be successful, meaningful, and effective for the participants.

Also as part of the approach taken by the ACOT researchers, we considered and analyzed our views about teaching and learning to begin to move away from "traditional instruction" into "knowledge construction." The knowledge construction was the approach taken by the ACOT researchers because it was the most effective, meaningful and successful approach. This

approach gave them positive results and it also gave us positive outcomes. All of the planned activities were learner-centered and interactive, my role was of a collaborator and learner, the participants role was of collaborators and sometimes experts because all of them brought more than a decade of teaching experience working with young children in public schools. Also the learning emphasis was of creating relationships and inquiry, the concept of knowledge was of transformation, the demonstration of success was the quality of the work they did during the computer sessions as well as the work they did at home. The assessment was of criterion-referenced and performance of their work and with their students, and the goal of the computer use was to communicate, collaborate, have access to information, and expression.

The ACOT findings were supported by the findings from Sandholtz, Ringstaff, and the Apple Corporation (1997) and Hughes (2001) who also found the "creation and exploration" of any computer education model for teachers to be crucial for it to be successful, meaningful, and effective to the learner. There were only two participants in the "creation or invention" stage, which is where teachers began to incorporate computers in their daily lessons to experiment with new instructional tools in ways that were meaningful, effective, and successful for the teacher as well as for their students. All five teachers were in the "exploration or appropriation" stage, which is where the teachers began to change their attitudes towards the usefulness of computers. During the interviews all of the teachers expressed positive attitudes towards using computers for their personal needs as well as in the classroom.

Stages of Concern Taxonomy

All of the teachers were past the "awareness" stage from the Hall and Hord (1987) Stages of Concern taxonomy, which was where teachers show little concern about or involvement with the innovation. In that stage teachers have negative beliefs on computers about the economic impact, the influence on children, the influence on peoples' health, peoples' dependency on computers, de-emphasis of human values, and the inappropriate uses of the computers. During our six months of interaction we worked on the "information" stage, which was where the participants learned how computers can be used as personal tools as well as educational tools and how they function. We also worked on the "personal" stage, which was where we reflected on our beliefs about our interaction with computers and the opinions of others about our relationship with computers. The next step is to work on the "management," where we will focus on time constraints, limited or inadequate resources, data integrity, and steps required to complete any computing task in the classroom or for our personal needs.

Several different researchers agreed the adoption as well as the adaptation of any new innovation is a process not a product, therefore teachers will go through the different stages of concern as well as the different levels of use each time they are presented with a new innovation. Evans (1996) suggested a "strategic systemic" approach when presenting teachers with the new innovation due to its effectiveness. I decided to take this approach when I invited teachers to join the computer leadership team. For this approach the

environment at times was turbulent and unpredictable, the organization was fluid and psychological, the planning was pragmatic, adaptable and medium-range. Also the adoption and adaptation was seen as a process with emerging outcomes, the focus was on the teachers, their culture and background. At the same time, the participants' meaning of computers, their motivation, and the implementation was top-down and bottom-up as well as commitment-building with a purpose and goal in mind. Since all of this was in place, the six months working with the participants was a meaningful, effective, and successful for all of us.

The following basic elements were part of the framework we worked from and with:

- Analyzed how teachers adopt and adapt any new technology
- Organized the program around teachers' needs
- The environment was carefully considered and analyzed
- We identified a purpose and the main goal of our group

Barriers

The amount of barriers that teachers must face when attempting to adopt and to adapt any new innovation must be minimized in order for any computer education model to be successful, effective, and meaningful. Researchers as well as the five participants of this study agreed that there are a significant amount of barriers that teachers face, which slows down the process of adopting and adapting any new innovation. They include:

- Funding

- Mentoring
- Equity and cultural awareness
- Access to computers in schools
- Appropriate and relevant equipment as well as materials
- Higher order thinking, problem solving skills and decision making
- Appropriate time and location
- Setting goals and objectives
- Acknowledging and respecting teacher's knowledge, skills, attitudes and perceptions.
- Involving all participants in the adoption process
- Addressing teachers' needs

Funding was not an issue because the computers, monitors and other equipment had been donated and the school was able to afford some computer software and other equipment needed. The participants had me as an on site mentor to reduce their anxiety and frustration level, while in school. I always made myself available to the teachers through weekly notes to let them know what my schedule was like for the week. The issue of equity and cultural awareness was carefully considered at all times. The teachers received additional support during lunch time or during the break with trouble shooting issues with their own computers in their classroom. In this way every teacher received equitable support based on their needs. There were times when some of the participants were absent from a computer session because they had other commitments with their family, with their community

or with their church. Also when we learned about inserting pictures from the Internet into a word document, the participants asked to go to web pages that were more educational because they did not want to see people with little clothing or in inappropriate pose. Therefore, in advance I searched for web pages that were not going to be offensive to any of the teachers.

All of the participants had access to computers in schools through the library, the computer lab and in their classroom. All of the computers were compatible, even though some of them had a slower processor. We had most of the appropriate and relevant equipment, even though I ended up buying a laptop and a printer with a scanner to show them what students can create with simple writing samples. The issues and topics presented in our computer sessions were of higher order thinking, problem solving skills and decision making for all of the teachers.

The appropriate time and location was chosen by the group of teachers. All of us set up our own goals and objectives. We acknowledged and respected each other's computer knowledge, skills, attitudes and perceptions. Also all of the participants were involved in the decision making process. The teachers' needs were addressed at all times by meeting every week for five minutes after our computer session. The teachers listed their needs and we compiled a list and covered their topics of interested as we meet each week. They also brought to the class work that they wanted to produce such a table, a list with bullets or numbered, or a newsletter.

Almost all five participants had positive attitudes about computers, however some of the researchers (Soner, 2000; Milbrath and Kinzie, 2000; Ropp 1999; Fann, Lynch, and Murranka, 1989) suggested that it will take teachers with negative attitudes longer to adopt and to adapt any new innovation. At the same time all of the participants had fears and anxiety about using computers because they had not had enough exposure and practice. The same researchers mentioned above also found that teachers' computer experience affects their perception and attitudes towards using computers.

Some of the teachers showed some level of computer phobia, but it was not to a level that would stop them from learning more about computers. Fann, Lynch and Murranka (1989) adopted some terms from Bandura who believed that negative attitudes and a loss of perceived control can influence people's ability to master a particular behavior. The five participants from the study did not have such negative attitudes and loss of perceived control as defined by Bandura because the teachers believed that they were able and very much capable of mastering new computer skills.

At the same time other researchers also agreed that the years of experience in using computers affects teachers' attitudes and willingness to adopt a new technology (Hughes, 2001; Fann, Lynch and Murranka, 1989). This was true for all of the participants of this study because they had negative experiences in their attempt to use computers. Many of the teachers expressed their disappointment when attending staff development

sessions because the computer session only lasted for an hour once every beginning of the school year. In other times, the teachers attended computer sessions that lasted three to four hours, after school, and they were tired by the first hour in class. Therefore, it was very important for all the participants of this study to have a positive experience, so that everyone's attitude could be more positive.

Researchers such as Bitter (1994) believed that veteran teachers were more capable of evaluating and reflecting upon lesson plans, teaching performance or teaching strategies in comparison to new teachers because of the number of years spent in the teaching field. To some extent Bitter's statement was reflected in the five teachers who I worked with, but at the same time those veteran teachers had more fears and anxiety about incorporating computers into the curriculum, while new teachers are more of risk takers. I worked with only veteran teachers and during the interviews they expressed a great amount of fear and anxiety and they also admitted that new teachers coming to the profession had more computer skills and knowledge and that they were more risk takers. Other researchers disagreed with Bitter because based on their findings novice and experienced teachers were equally capable to evaluating and reflecting upon their teaching, more so if it is about integrating technology into the curriculum (Milbratch and Kinzie, 2000; Ropp, 1999; Yildirim, 2000).

Hughes (2001) stated that another barrier is where teachers find that technology limits them to remain as consumers instead of creators or

explorers of it. In this study, we made every attempt to stay away from remaining as consumers, but rather become creators and explorers of it. We collectively came up with ideas for the next meeting as well as projects that we wanted to explore and create. All of the participants agreed to the creation and exploration of the projects, so that every one felt that their opinions were validated and respected. For instance, in our of our meetings the teachers wanted to learn how to insert pictures onto a document downloaded from a CD ROM, from MS Word clipart, and from the Internet.

Hughes (2001) stated that there were other barriers such as the internalized experience of the learner which deals with the cognitive styles and affective perceptions of learning and using technologies. However, it also has to do with self-identity based on social class and culture. The external barriers to learners' control deals with the available resources, societal roles and cultural norms, and with the education levels and opportunities (Hughes, 2001, p. 4). It also includes self-identity based on social class and culture. As part of our goal of this study we tried to minimize the amount of external barriers by using all of the available resources. There were some of the external and internalized barriers that each one had to work on such as our self-identity based on social class and culture, societal roles, cultural norms, and educational levels and opportunities.

However, we worked hard to break some of those barriers such as the breaking away from the traditional views of teaching and learning and the expectations and norms that society has imposed on teachers. For example

a societal role expects for teachers to know everything and students to know nothing and we must fill the empty brains of students with information. This misconception and misinterpretation about teaching and learning began to change in all of the participants because during the interviews all of them admitted that many times the students were the experts in using computers and that the teachers had to learn from the students.

The ACOT researchers as well as Hughes and Yenkin (1998) agreed that teachers do not change over the course of a training session; they need time, resources, and support in order to adopt and adapt new technologies. This was true for all of the participants of the study because in a term of six months we moved from one level of use to the next and from one stage of concern to the next one. They had my support, the resources, and the only thing we needed the most was more time to spend in our computer sessions. The participants had equitable support and access to computers because some of them asked me to come an extra ten minutes to their classroom during lunch time to show them how to do certain things in their own computers. Others preferred to meet only once a week because they felt that it was all they needed.

After analyzing the findings and the research about the levels of use, the stages of concern, and the barriers I would like to continue with the computer education sessions with the same type of model we worked on for six months. The components of the model we would continue to work with was partly adopted from the suggestions from other researchers.

Program Model Components

With this model teachers would be educated to use computers and not trained. Educating teachers to use computers is to help them and guide them through the process of adoption and adaptation. On the other hand training teachers to use computers is a short-term fix to tell teachers what the computers can or cannot do.. Caverly and colleagues (1997) stated that in Piagetian terms educating teachers to use computers is to help them accommodate new knowledge rather than simply assimilate another process, which is what training does for teachers. "We use the word educating to emphasize the need for teachers to think differently about rather than merely know what to do with it" (Caverly et.al, 1997, p. 56). This will continue to be the main objective of the program model suggested to my school site.

- Create a Vision, set Goals and Objectives
- Minimize Amount of Barriers
- Involve All Stakeholders, all Participants' input is Considered and Respected.
- Meet Once a Week for 20-30 Minutes
- Integrate Computers into the Curriculum
- Commit to Professional Development
- Ensure a Sound Infrastructure
- Plan for Ongoing Monitoring and Assessment
- Plan Activities Around Teachers' Needs

Duhaney (2001) agreed that when technology instruction is more student-centered, then the student becomes the manipulator of the environment and learns to practice the principles of teaching and learning with a constructive behavior. Teachers of the computer education group will be involved in process and would follow the strategic systematic approach and their approach to teaching and learning would be of knowledge construction and begin to move away from the traditional instruction. The strategic systematic approach, the knowledge construction practice of pedagogy and learning have been proven to be the most successful practices for teacher to adopt and to adapt any new innovation with a greater success. At the same time the process of adaptation and adaptation becomes more effective, meaningful and successful for all of the participants.

If this program model is followed for a long period of time all of the participants will move to the next learning level as well as the next level of use. They will go through the stages of concern every time they learn a new skill or a new computer software. The participants will feel successful just like the five participants and my self felt during those six months of interaction and support. I will continue to lead this group and to be a support for the participants. I will also continue with the routine that we have followed. It has been a privilege to be part of the study because we shared our expertise and we taught each other what we know how to do best.

My main goal and objective of this study was for teachers to begin to view computers as an educational tool and not as the curriculum or as the teacher. I

view the curriculum and teaching standards as the route that students and teachers must walk through. The teachers are the drivers of the vehicle and the computers are the vehicle that teachers must use as tools to help students better understand the curriculum standards. If we, as teachers, act as drivers and if computers are used as a vehicle for students and teachers, the curriculum and teaching standards is a path to drive through. The curriculum as well as the computers are only as effective, as meaningful and as successful as teachers make them for the students. The computers mean nothing if teachers do not give them power. When teachers use computers as a teaching tool students become empowered of their own learning and they also become critical and expressive learners.

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Questions for the Interviewees

1. How many years of teaching experience do you have?

2. How long ago did you receive your credential?

3. How much training did you have before you began teaching?

4. When/how were you introduced to using computers as personal tools and as educational tools?

5. How are you using the existing computer software in your classroom? In what ways are you using the existing computer software in your classroom?

6. What is the best way for you to become familiar with computers as a personal tool and within the curriculum?

7. What influenced you to learn about computers?

8. What computer software do you use more often?

9. How often do you get to use the computer program?

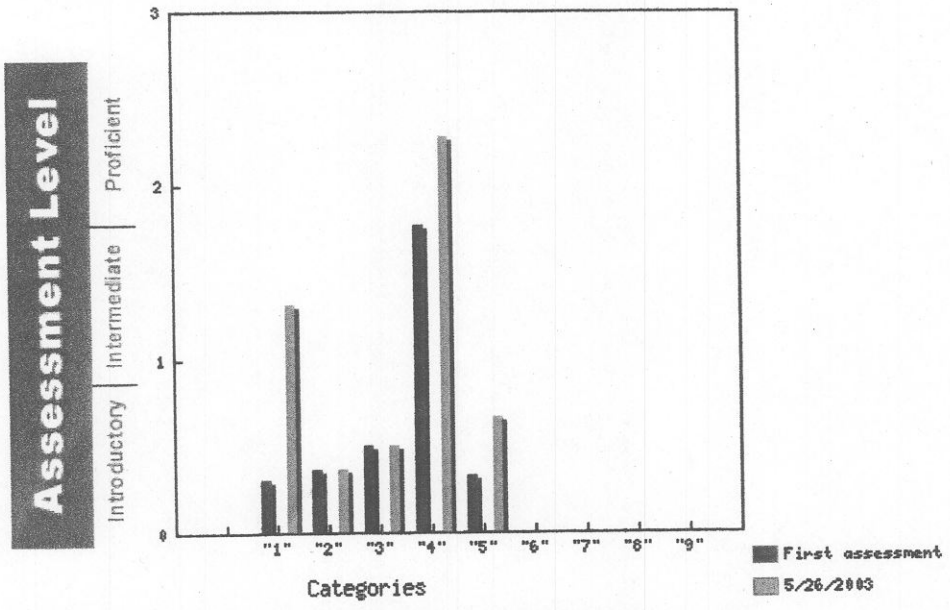
10. Which features of this program that you use?

11. Have you ever had any difficulties using the program?

12. What kinds of difficulties have you had?

13. What are some of the ways that you try to use to find solution to those difficulties?

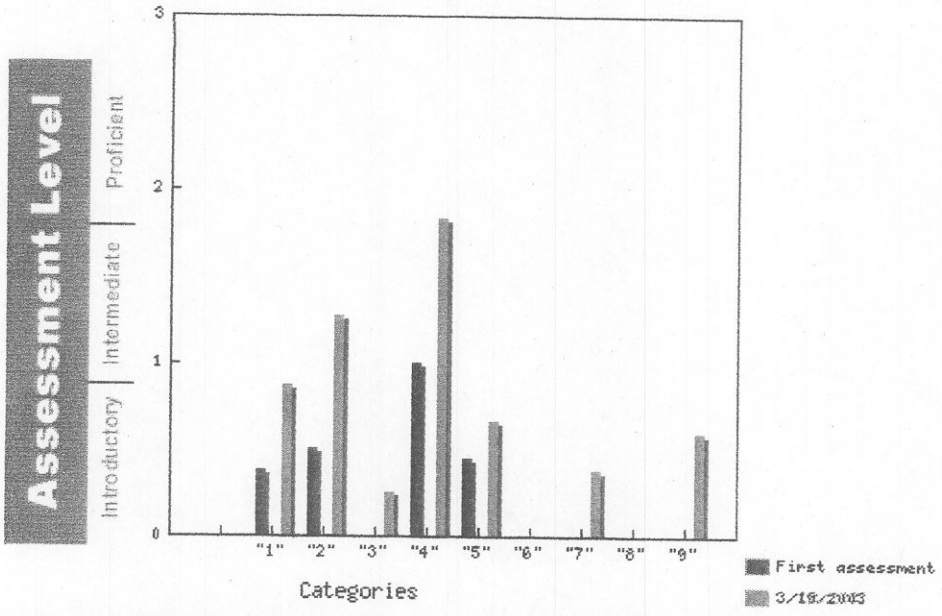
Custom Comparison Chart



(Click on the category name to see the individual category chart.)

1 General Computer Knowledge and Skills
2 Internet
3 Email
4 Word Processing
5 Publishing
6 Databases
7 Spreadsheets
8 Presentation Software
9 Instructional Technology

Custom Comparison Chart



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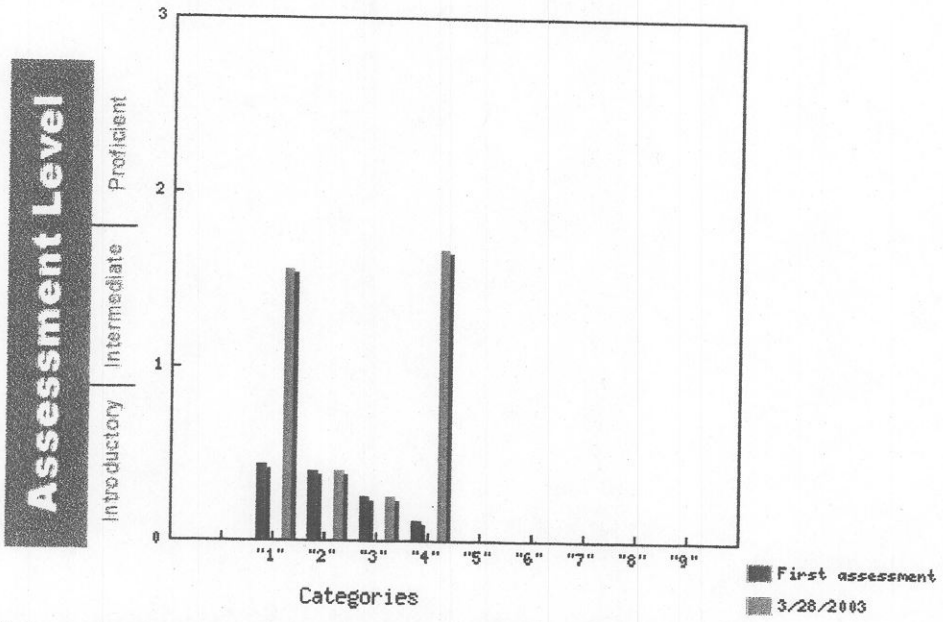

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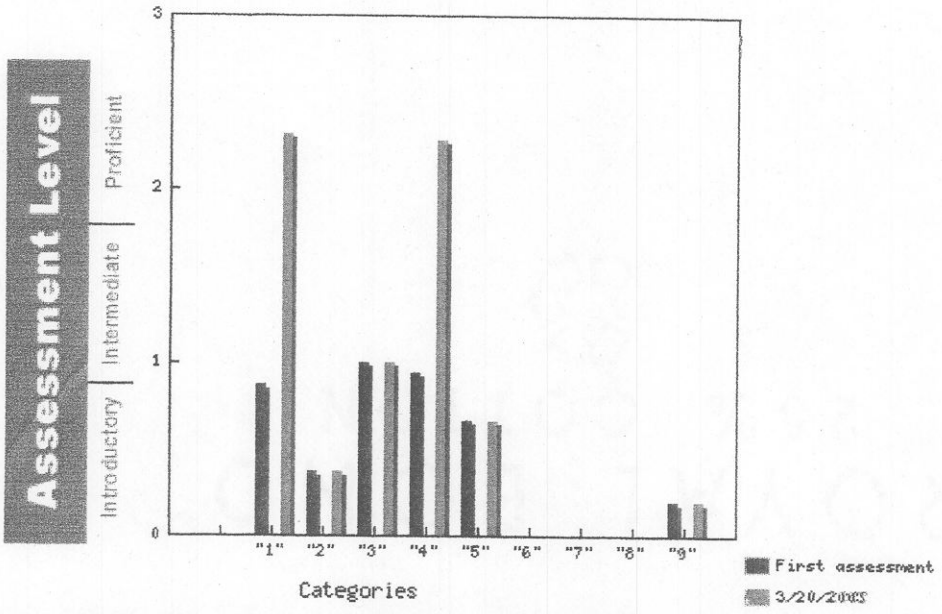

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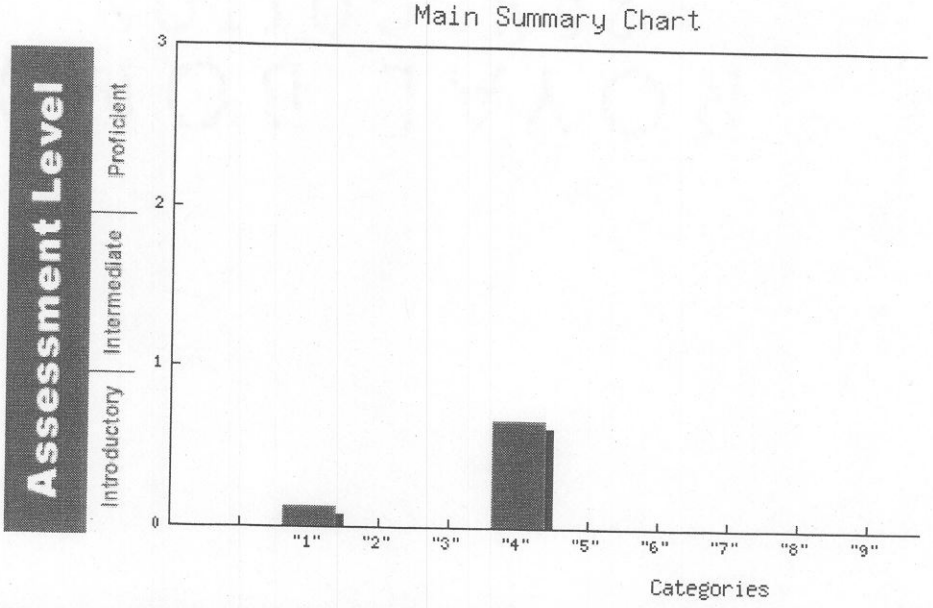
Assessment Questions
Summary Chart
Resource Catalog
Personal Environment
Rubrics
Site Summary Charts
Main User Menu
Logout

My Personal Summary Chart on 05/03/2002



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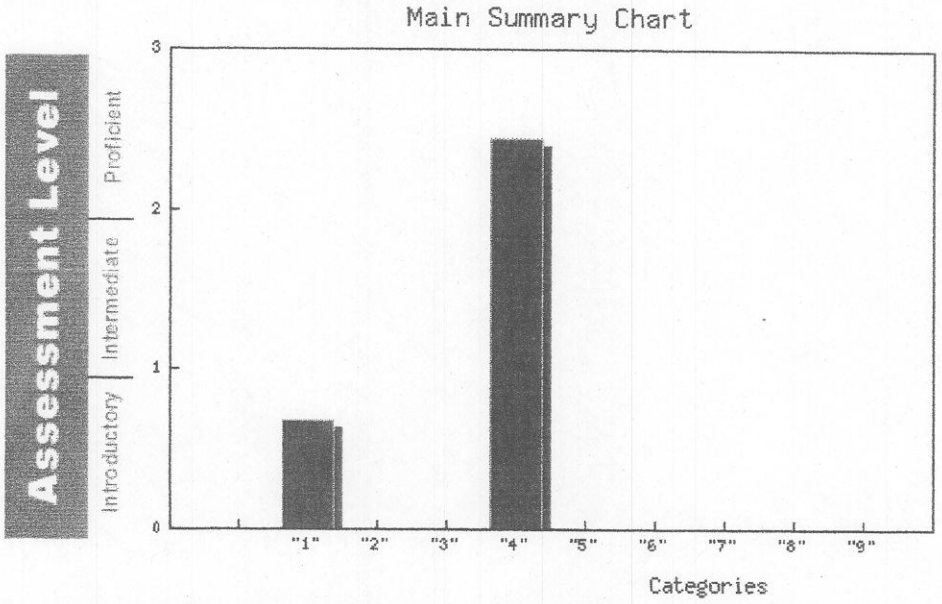
My Personal Summary Chart on 03/14/2003



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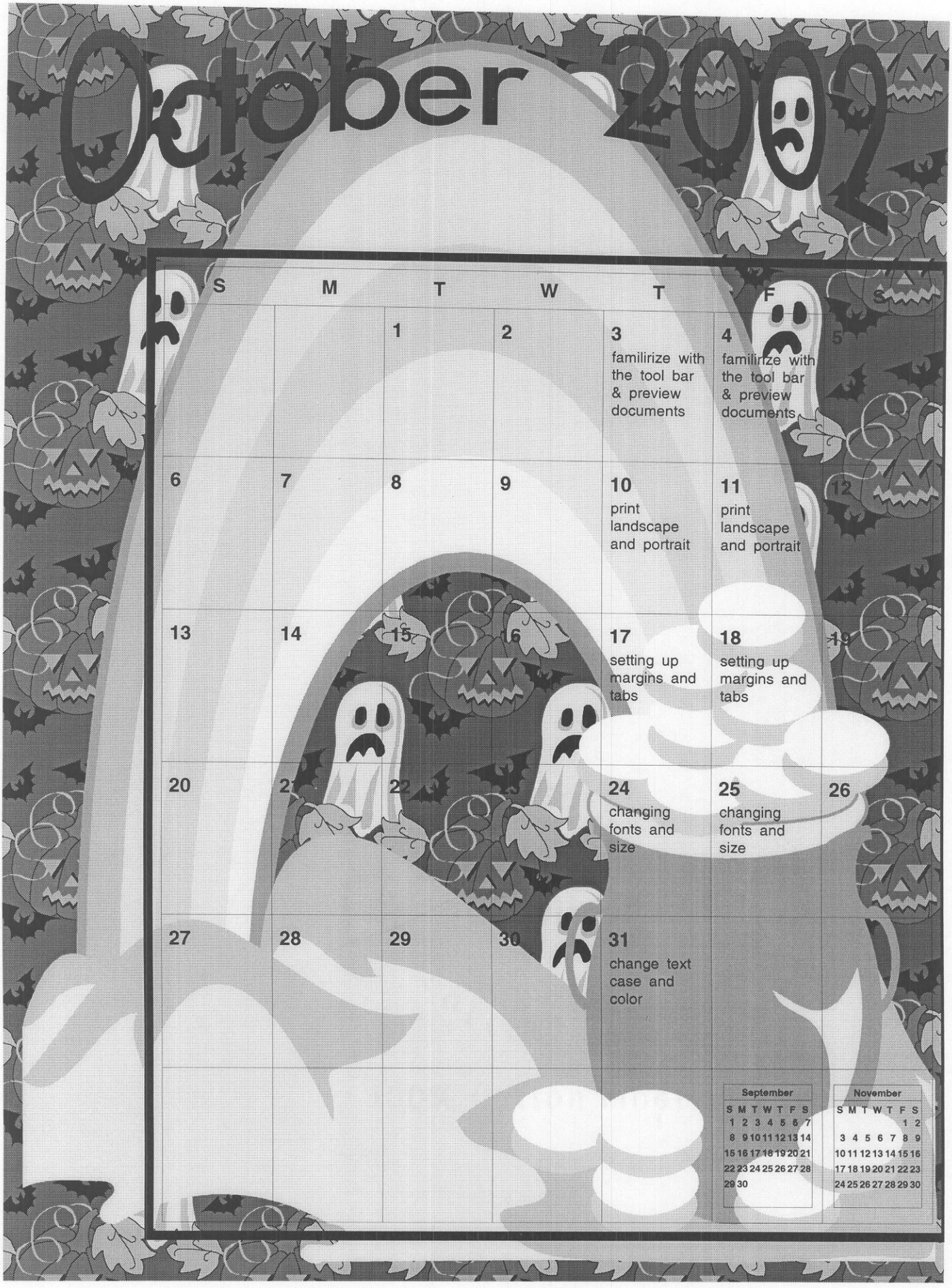
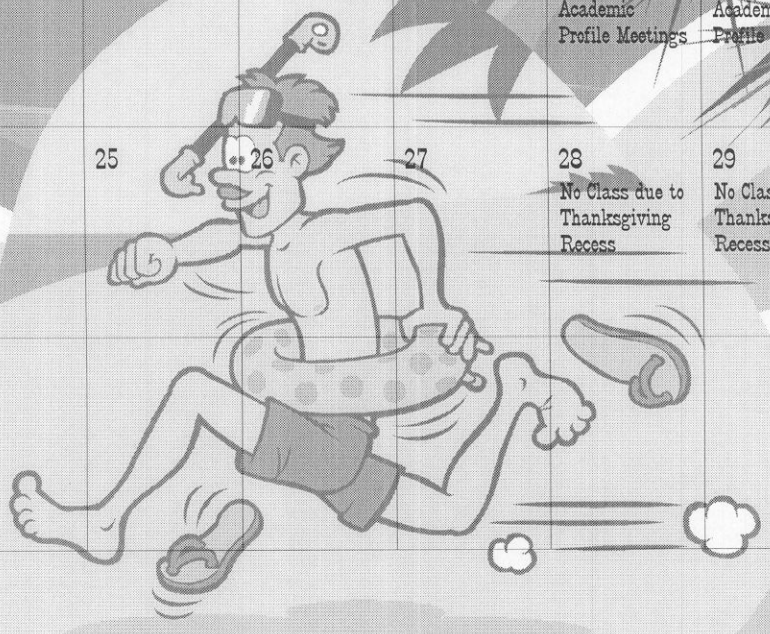
8 Presentation Software
9 Instructional Technology

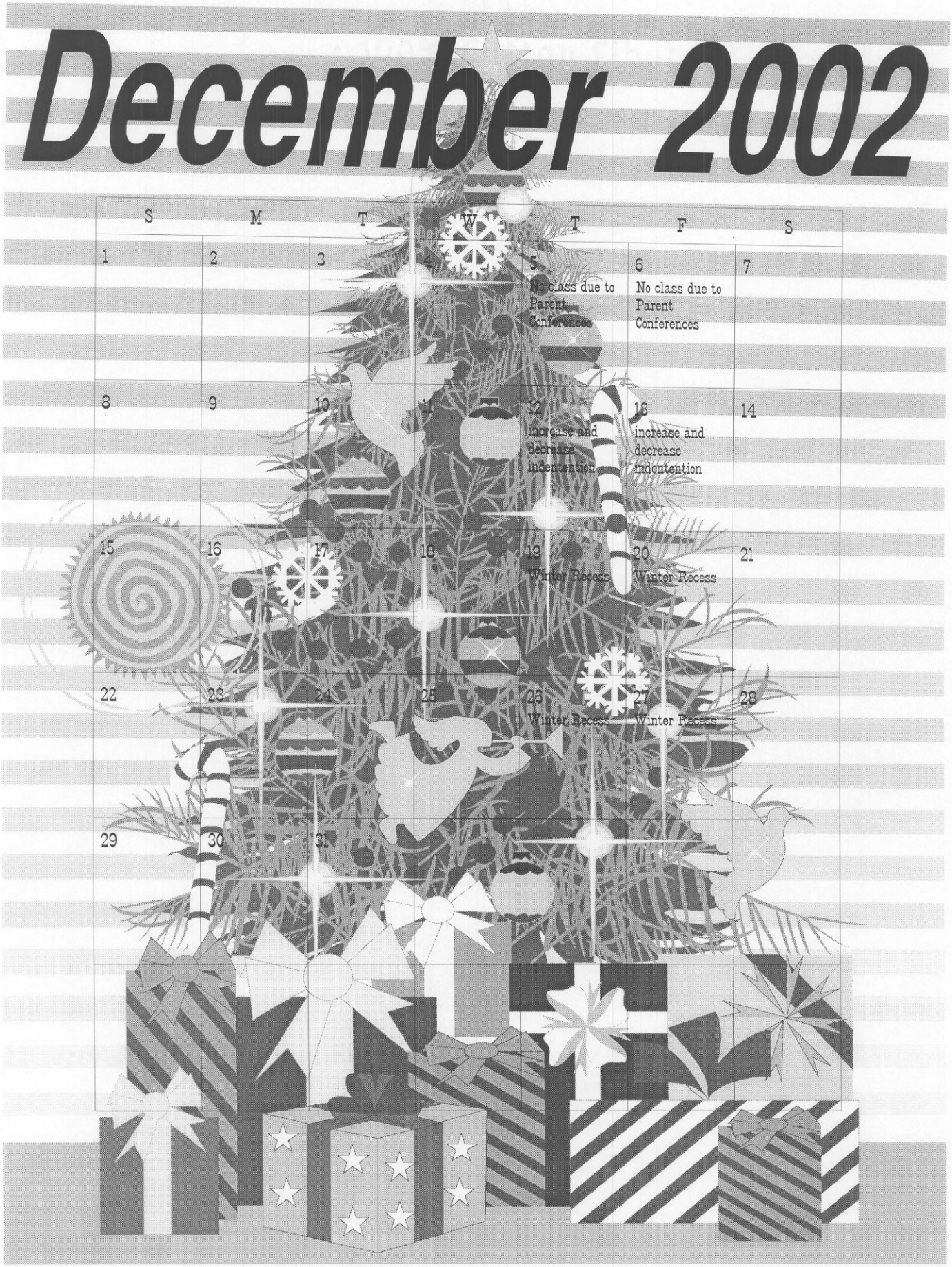

October 2002
S M T W T F S
1 2 3 4 5
3 familirize with the tool bar & preview documents
4 familirize with the tool bar & preview documents
6 7 8 9
10 print landscape and portrait
11 print landscape and portrait
12
13 14 15 16
17 setting up margins and tabs
18 setting up margins and tabs
19
20 21 22
24 changing fonts and size
25 changing fonts and size
26
27 28 29 30
31 change text case and color
September
S M T W T F S
1 2 3 4 5 6 7
8 9 10 11 12 13 14
15 16 17 18 19 20 21
22 23 24 25 26 27 28
29 30
November
S M T W T F S
1 2
3 4 5 6 7 8 9
10 11 12 13 14 15 16
17 18 19 20 21 22 23
24 25 26 27 28 29 30

November 2002

S	M	T	W	T	F	S
					1 change text, case and color	2
3	4	5	6	7 No class due to Academic Profile Meetings	8 numbering, bullets, and font color	9
10	11	12	13	14 No class due to Academic Profile Meetings	15 No class due to Academic Profile Meetings	16
17	18	19	20	21 No class due to Academic Profile Meetings	22 No class due to Academic Profile Meetings	23
24	25	26	27	28 No Class due to Thanksgiving Recess	29 No Class due to Thanksgiving Recess	30



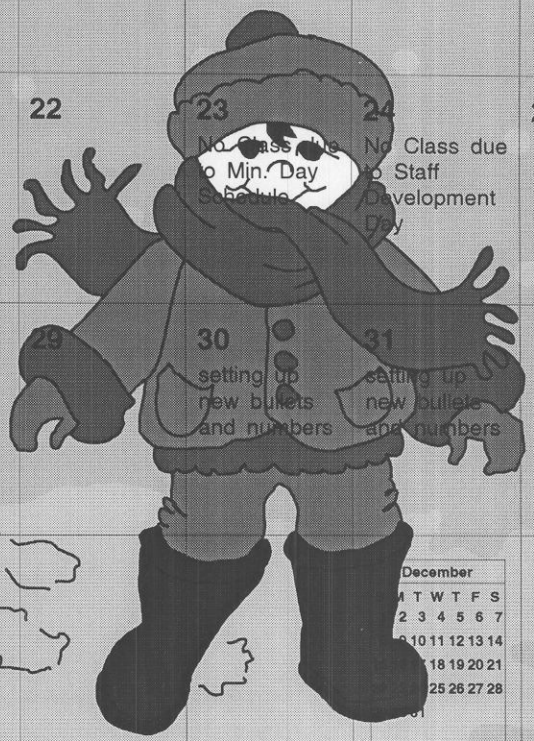
December 2002



S	M	T	W	T	F	S
1	2	3	4	5 No class due to Parent Conferences	6 No class due to Parent Conferences	7
8	9	10	11	12 increase and decrease indentention	13 increase and decrease indentention	14
15	16	17	18	19 Winter Recess	20 Winter Recess	21
22	23	24	25	26 Winter Recess	27 Winter Recess	28
29	30	31				

January 2003

S	M	T	W	T	F	S
			1	2 open and close a document	3 open and close a document	4
5	6	7	8	9 center, left and right alignment	10 center, left and right alignment	11
12	13	14	15	16 single and double line spacing	17 single and double line spacing	18
19	20	21	22	23 No Class due to Min. Day Schedule	24 No Class due to Staff Development Day	25
26	27	28	29	30 setting up new bullets and numbers	31 setting up new bullets and numbers	



December

S	M	T	W	T	F	S

February

S	M	T	W	T	F	S
						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	


S M T W T F S
1
2 3 4 5 6 making a new table with rows and columns 7 making a new table with rows and columns 8
9 10 11 12 13 changing the size of the table 14 changing the size of the table 15
16 17 18 19 20 putting borders to the table 21 putting borders to the table 22
23 24 25 26 27 shading cells in a table 28 shading cells in a table
February 2003

March 2003

S	M	T	W	T	F	S
						1
2	3	4	5	6 No class due to Report Cards	7 No class due to Report Cards	8
9	10	11	12	13 make an alpha and numeric list	14 make an alpha and numeric list	15
16	17	18	19	20 create a new document and save it	21 create a new document and save it	22
23	24	25	26	27 open and close existing documents	28 open and close existing documents	29
30	31					

February

S	M	T	W	T	F	S
						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	

April

S	M	T	W	T	F	S
		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30			

April 2003

S	M	T	W	T	F	S
30	31	1	2	3 insert clip art and a text	4 insert clip art and a text box	5
6	7	8	9	10 resize, move pictures and a text box	11 resize, move pictures and a text box	12
13	14	15	16	17 Stopped collecting data	18 Stopped collecting data	19
20	21	22	23	24 Spring Break	25 Spring Break	26
27	28	29	30	1	2	3
4	5	6	7	8	9	10